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PROCEEDINGS. CONFERENCE IN THE MATTER OF POLLUTION OF THE NAVIGABLE WATERS OF BISCAYNE BAY AND ITS TRIBUTARIES IN THE STATE OF FLORIDA, HELD AT MIAMI, FLORIDA, ON FEBRUARY 24, 25, 26, 1970

Federal Water Pollution Control Administration
Washington, D.C.

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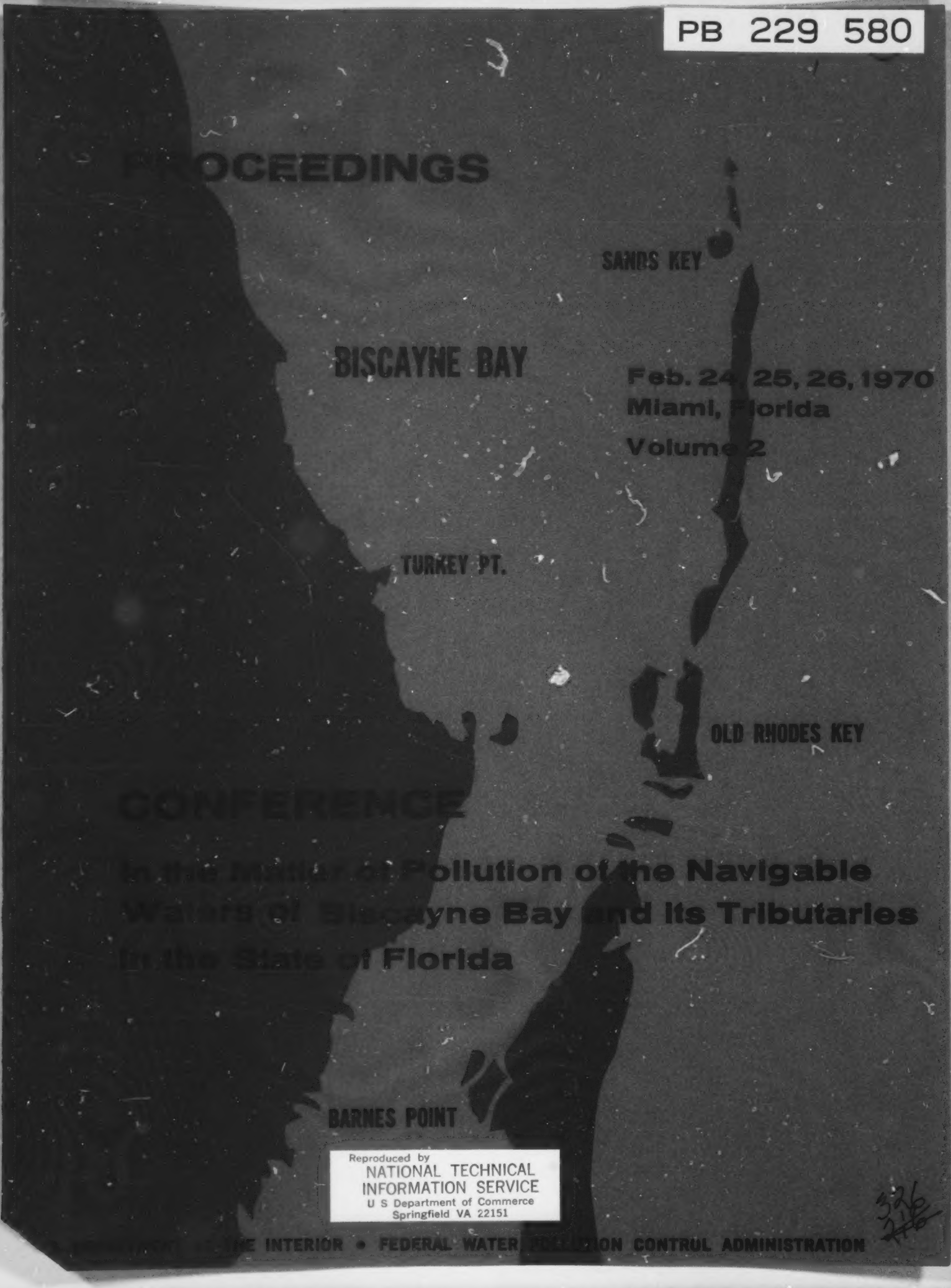
PROCEEDINGS


SANDS KEY
BISCAYNE BAY
TURKEY PT.
OLD RHODES KEY
BARNES POINT

Feb. 24, 25, 26, 1970
Miami, Florida
Volume 2

CONFERENCE

In the Matter of Pollution of the Navigable Waters of Biscayne Bay and its Tributaries in the State of Florida

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THE INTERIOR • FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

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PROCEEDINGS

MR. STEIN: We will now reconvene.

Mr. Reed.

MR. REED: Col. Davis.

MR. STEEL: Our next witness will be Dr. Lackey, Mr. Chairman.

DR. JAMES B. LACKEY, CONSULTANT,
FLORIDA POWER & LIGHT COMPANY,
MELROSE, FLORIDA

DR. LACKEY: My name is James B. Lackey. I have a Ph.D from Columbia University in Zoology. I have had some 35 years experience in water pollution problems -- much of it marine. Included are more than 12 summers at Woods Hole in the laboratories there, two summers at Scripps Marine Biological Laboratory, 10 years as senior biologist in stream pollution for the U.S. Public Health Service and the remainer in editorial work in universities and colleges.

I have conducted ecological studies at the Turkey Point Powerplant for about two years. Part of the investigation involved quantitative and qualitative analysis of the plankton of the area.

Dr. James B. Lackey

Apropos of the talk by Dr. Tarzwell yesterday, the following is perhaps in order. Not all of the water coming in goes through the condenser tubes. That will be amplified later on.

Of the water that does go through, I have found no more than normal variation in the plankton passing through the condenser tubes despite temperatures that have reached 108°F at the immediate discharge.

The method of -- and this is not part of the prepared statement. The method of determining these things has depended upon putting slides at the beginning and end of the condenser tubes, leaving them there for periods from 24 to 72 hours, examining them under the microscope to see what living organisms had colonized during that time, making analyses quantitative and qualitative of the plankton organisms taken by sampling water, and removing the organisms by centrifuge at 2200 RPM so that they were not killed.

Numbers of plankton species and numbers per ml existed at about the same level, for as many as 23 sampling stations in the bay within and outside the area of the plant discharge. Species varied somewhat, so that over a year's time a list of perhaps 300 to 400 can be compiled.

These numbers per ml are small, compared to such a place as Great South Bay, Long Island, New York, where I worked. The reason for this small population is poverty of nutrients -- orthophosphate at the intake, 0.014 ppm; nitrate nitrogen 0.13 ppm.

Great South Bay has much more nutrients. For example, it has a much greater quantity of nutrients. The Gulf Stream, which has a much lower population than at Turkey Point, has 0.002 ppm orthophosphate.

Slides suspended in the intake and effluent streams for 24 to 72 hours developed good growths of microscopic algae and protozoa. It also developed some nematod worms and a few other macro-organisms such as copepods.

Frequently the species varied in composition, at least partly so, and numbers per 25 mm^2 varies. But growths were always obtained, regardless of temperature.

The above facts for plankton are derived directly from field data. In brief, the plant discharge has had no effect on plankton.

The macroscopic algae, Acetabularia and

Dr. James B. Lackey

Batophora have migrated into Grand Canal -- that's this canal here and into Little River, this one right here, both of which received plant effluent, and of importance over a long period of time, as you were told yesterday. Acetabularia and Batophora have migrated into Grand Canal almost to the condenser effluent despite temperatures above 100°F. Other algae such as Dasya are present in parts of the canal system.

Cuban shoal grass and turtle grass have grown throughout these two years within the area adjacent to the mouth of Grand Canal, which has experienced temperatures well in excess of 95°F. These are luxuriant growths and have been present consistently. Their rhizomes, the undergroud stems, have not been killed at all by the increase in temperature.

We do not have information on what vegetation and what animals were present in Biscayne Bay adjacent to the mouth of Grand Canal before this canal emptied warm water into the Bay.

We do, however, have ample evidence that the entire Card Sound-Turkey Point area has great bare patches in the midst of luxuriant growths. And we have abundant observations that turtle grass beds show deterioration and recovery far removed from the influence of the plant discharge. Right now the best stand of turtle grass is in the warmed water of Little River, and the densest bed I have found is not far off the mouth of Grand Canal.

Mullet, needlefish, barracuda, snook, and mangrove snappers are abundant in the whole plant area. So are vast numbers of fingerling fish at this time. None of these were killed in the plant area by the recent cold weather which killed uncounted thousands elsewhere in Biscayne Bay.

Considering the large number of plankters, macroscopic algae, crustaceans, fishes and grasses which have either persisted in or migrated into this area for at least two years of my study, despite temperatures in some parts of it of substantially in excess of 95°F, it is my considered opinion that the discharge of the Turkey Point cooling water into Card Sound at a temperature not to exceed 95°F will not cause damage to the aquatic life.

I am totally unwilling to accept the factually unsubstantiated Federal Water Pollution Control Administration report to the contrary.

Thank you.

MR. STEIN: Thank you. Any questions or comments?

MR. REED: Yes.

MR. STEIN: Mr. Reed.

MR. REED: Dr. Lackey, on Page 3, you say: "We do not have information on what vegetation and what animals were present in Biscayne Bay adjacent to the mouth of Grand Canal before this Canal emptied warmed water into the Bay."

Would not that area have been rather typical of the entire Bay?

DR. LACKEY: Presumably, but, Mr. Reed, remember, that there are huge bare patches scattered throughout.

MR. REED: I have that marked very well. I will come to that. Isn't it reasonable to assume that the area was somewhat similar to the rest of the Bay?

DR. LACKEY: That's a reasonable assumption.

MR. REED: So these bare patches in the midst of luxurious growth -- we saw a whole bunch of photographs yesterday, dead fish, molluscs, crustaceans and grasses. Would those be the typical of the other bare patches in the Bay?

DR. LACKEY: I'm not sure I got the import of your question.

MR. REED: I'm having trouble -- I saw a great many photographs yesterday of the apparently -- it is apparently a dead bottom with dead molluscs, crustaceans and fishes and other things that were retrieved from this bottom. Would it be typical of the other patches in the Bay to find dead fishes and grasses in them or not?

DR. LACKEY: No. Immediately at the mouth of Grand Canal there is an area where there has been apparently some damage, either from current or from temperature or from some other reason.

MR. REED: Current, temperature, and what other reason would it be?

DR. LACKEY: Possibly denuding by silt, possibly an accumulation of silt.

MR. REED: Would that be an inherent problem in any velocity that one had, future velocity? Would this be a similar problem?

DR. LACKEY: Well, it would depend on two things. It would depend upon the nature of the bottom where the velocity occurred, and if the bottom, for example, fine silt it would be readily removed. If it were sand, it would not readily be removed. If it was peat, it would not be.

MR. REED: In your biotic index where you substantially saw, on the last page, you saw a very large biotic index in waters, substantially in excess of 95°. Was this in the summer months or winter months? Was this year-round, this condition?

DR. LACKEY: This was a year-round condition.

MR. REED: You saw a very large biotic index in the summer as well as in the winter?

DR. LACKEY: As well as in the winter.

MR. REED: I think that's in somewhat contradiction of what we heard yesterday.

DR. LACKEY: That's right.

MR. REED: And I think you and Dr. Tarzwell could not agree on the subject of the viability of fishes at certain degrees of temperature.

DR. LACKEY: I can't speak for fishes, Mr. Reed. I'm not an expert in that field.

MR. REED: But on algae and --

DR. LACKEY: That's right.

MR. REED: -- and molluscs.

DR. LACKEY: That's right, we do disagree.

MR. REED: And crustaceans?

DR. LACKEY: Yes; some crustaceans.

MR. REED: I do need information about the amount of kill coming through the condensers, phytoplankton, the plankton that you have been able to find. We have a report on the number of pounds per day attributed to kill coming through the condensers that were taken by plankton nets, but you have not yet been able to disover this amount of poundage or very small amount of poundage that comes through dead?

DR. LACKEY: No, I have not, Mr. Reed. I have not used a plankton net to pick up the larger plankton, and the smaller plankton is not killed in toto, if at all.

MR. REED: Would the higher temperatures of the nuclear powerplant, do you suppose that would reach the life limits of the phytoplankton and plankton that are coming through? It seems like they are all right over in Crystal Stprings where you have been doing some work, and we have been. A great majority of the plankton over there are all right. Do you think the upper ranges of the nuclear powerplant will cause a life limitation on plankton coming through?

DR. LACKEY: I would say the temperatures would have to be in excess of 108°, Mr. Reed, and I do not believe that they will be this high, in excess of that. However, someone else from Florida Power & Light Company could answer that question.

MR. REED: Thank you, Dr. Lackey.

MR. STEIN: Any other questions?

MR. PATTON: Yes, I have a question. Go back to the original paragraph that Mr. Reed mentioned. It seems to me a little bit in contradiction. Col. Davis, I believe, late yesterday afternoon told us about the company spending something like a million dollars on obtaining information. My understanding is that they had retained the Institute of Marine Sciences and various people.

DR. LACKEY: I'm sorry. I didn't hear that. I don't hear too good.

MR. PATTON: I'm sorry. You indicate in the original paragraph that Mr. Reed referred to on Page 3 about the lack of information on vegetation and animals, and Col. Davis spoke yesterday afternoon about spending a million dollars plus or minus on obtaining information.

I thought the studies were carried out in this area before the plants were started.

DR. LACKEY: Well, I have only worked in this area about two years, and if there was other work done on the organisms that I have talked about, I'm not aware of it.

MR. STEIN: Any other questions or comments?

Dr. Lackey, what would you say would be the fate of the plankton in that proposed six-mile canal if they were exposed to the heat? Do you think they would come through unscathed to be discharged into Card Sound? Do you think that will happen?

DR. LACKEY: If the temperature drops in that canal due to dilution down to a hundred or less, the plankton would not be substantially altered, in my opinion. There might be some deaths at 100° but at 95° I would expect none.

MR. PATTON: You have no judgment, though, as to the effect of water on the fishes that Dr. Tarzwell talked about -- the heat?

DR. LACKEY: No, not on the fishes.

MR. STEIN: Now, there are two other points: 1) You indicate that a place like Great South Bay has a lot more nutrients. We had an enforcement conference up there. There are a lot more nutrients at that place and it was terribly polluted. It changed the whole ecology of the bay, and we had to go in there to prevent the deprivation of the shellfish and oyster area in Great South Bay. A good deal of these nutrients came from duck farms and the population in the area. The ducks do very well naturally there, but were contaminating the entire National seashore.

This is the kind of thing, I think that if we agree with the description of Card Sound and Biscayne Bay, I am not sure that the initial nutrients are going to be desirable necessarily.

DR. LACKEY: There are two things to be considered, Mr. Stein, and I have worked on Great South Bay since about 1942, off and on, and I have turned in a number of reports on Great South Bay to the New York State Conservation Department and other agencies.

First of all, the area there has been ruined by the duck farmers and has been ruined for several reasons. The mount of phosphate and nitrate and especially phosphate in that area is enormous compared to the amounts in Card Sound and the area around Turtle Point.

Second, in addition to the nutrients, vast amounts of sludge have accumulated in that area.

Third, only the oyster industry has been seriously hurt -- the entire holdings of Mr. Mercer and the Blue Point Company. Various and sundry other companies there have not been hurt -- at all. They harvested enormous crops of clams. The oysters were hurt; the clams were not.

MR. STEIN: I know we can go into detail on that. But, you know, Mr. Mercer had to sell out the Blue Point Company. He couldn't make a go of it. But the notion here, of course, is that when you talk about sludge, that is a contaminant of nutrients that get into the bay.

I think if we listened to what Dr. Tarzwell said, you will recall he talked about these dead carcasses again adding to the putrefacation. I hope we won't duplicate that problem here. I believe it was the conclusion of the New York State conferees and Federal conferees that we had a serious problem in Great South Bay. We had to put in some pretty drastic measures to change it. It cost the duck farmers and local government a lot of money. I would hope we would not have the same conditions here.

I grew up in that area. I'm a Long Island boy. When I was a young boy those waters were fine, perhaps, as good as the waters here. But they are not that way any more.

Let me go to your last statement in which you say, "I am totally unwilling to accept the factually unsubstantiated Federal Water Pollution Control Administration report to the contrary." This is your last statement here. Can we take the outburst of that for this, and I don't understand by implication, but do you want us to accept your conclusions on the basis of this 4-page report?

DR. LACKEY: I would expect so, yes.

MR. STEIN: All right. Thank you.

MR. STEEL: Mr. Chairman, our next witness will be Dr. Wurtz.

DR. CHARLES B. WURTZ, ASSOCIATE PROFESSOR, LA SALLE COLLEGE, PHILADELPHIA, PA.

DR. WURTZ: Mr. Chairman and conferees, my name is Charles B. Wurtz. I am a Consulting Biologist, a resident of Philadelphia, and specialize in pollution biology. I have been in the academic field for more than 20 years.

Dr. Charles B. Wurtz

The statement I am going to present has been prepared and has attached to it a curriculum vitae for those of you who are not acquainted with me.

I first visited the Turkey Point plant site and made initial studies in January of 1968. My most recent visit to the Turkey Point plant site was January 25 of this year.

East coast temperatures at Key West range from about 72°F to about 86°F according to Fleming (1957). These would be the average cold-weather and warm-weather water temperatures. However, Fleming was using broad-brush strokes in his presentation and did not go into detail for relatively localized areas.

Glooschenko (1968) stated that maximum temperatures in Florida estuaries reach 93.2° to 95.0°F. He also observed that the actual upper thermal limits for most species found in Biscayne Bay are not known. One reference included in Glooschenko's presentation was that of a study published in 1914 by A. G. Mayer. In the latter study Mayer determined the thermal death point of eight representative marine animals from the Tortugas. These thermal death points were: 95°, 96.8°, 99.4°, 101.3°, 104.0°, 108.1°, and 115.3°F (presumably two species shared some one of these thermal death points).

Glynn (1968), working in known tropical waters, reported on sea urchins of Puerto Rico reef flats. He noted an ascending order of resistance according to temperature and time of exposure. The maximum temperature tolerated, and the time to death as observed follow:

Tripneustes, 4 hours of exposure at 95.0°F.
Lytechinus and Diadema, 96.8°F after 2 hours.
Brissus, 96.8°F after 4 hours.
Echinometra viridis, 100.4°F after 3 hours.
Echinometra lucunter, 102.2°F after 3 hours.

The reef flats studies by Glynn were characterized by three key species: a green alga (Halimeda opuntia), turtle grass (Thalassia testudinum), and a coral (Porities porites). According to Glynn the sea water temperatures in isolated pools and on shallow flats at times of low tide would reach 95.0° to 104.0°F, and this for as long as one to two hours. These key species would thus be sporadically subjected to such thermal conditions. Nevertheless, they were not eliminated from the reef pools. Glynn also observed a

Dr. Charles B. Wurtz

series of animal species that were subjected to heating up to 104.0°F with no apparent mortalities. These animals included corals (Zoanthus sociatus, Porites porites var. furcata), snails (Bulla striata, Batillaria minima, Petaloconchus (Macrophragma) varians), crabs (Clibanarius tricolor, C. Antillensis), and a large sea anemone (Phyllactic flosculifera). Glynn cited a study by K. R. H. Read who found several species of intertidal bivales with relatively high thermal tolerances, usually above 104°F.

During biological surveys of San Antonio Bay, Texas, temperatures during the fall season exceeded 93°F, but this area supported commercial oystering and shrimping as well as a normal complement of estuarine organisms. Temperatures above 93°F were recorded routinely; during these investigations no attempt was made to identify the maximum temperature of these waters. We do know that the upper lethal temperature for the oyster has been reported as 119.3°F in New Brunswich, Canada (Gunter, 1957).

It is not surprising to find high thermal tolerances for tropical estuarine species. Kinne (1967) noted that water temperatures in estuaries usually exhibit greater annual and diurnal fluctuations than do the seas and, further, that pronounced environmental variation is a basic characteristic of an estuary. Kinne also observed that estuarine invertebrates and fish lack effective mechanisms for temperature regulation and are, therefore, thermo-conformers. Kinne said: "Estuarine organisms exhibit a variety of compensatory measures reducing the impact and potential ill effects of their rough osmotic and thermal environment." With respect to temperature he stated that acclimation represented the essential means for compensation and adverse temperatures are tolerated rather than compensated for. In the latter case, various physiological activities, such as metabolic rate and reproduction would be affected. But this will not represent high-temperature stress conditions at Turkey Point because the anticipated temperature maximum will be transient and limited to the warm-weather season. Biscayne Bay is more subject to cold kills than to heat kills.

It is apparent that where filed studies of thermal tolerance have been made in southern waters stress conditions for the dominant organisms do not develop until water temperatures exceed 95°F for some period of time.

Dr. Charles B. Wurtz

In an estuary where intolerable temperatures did occur, and persist, estuarine organisms would respond by one or more of four compensating measures. These four are identified by Kinne (1967) as escape, reduction of contact, regulation, or acclimation. Under the most extreme conditions only escape would be feasible, and this would be limited to motile animals such as the fish, some crustaceans, etc. At the same time, when the intolerable temperatures were eliminated there would be a quick resurgence of organisms into the affected area. For example, Glynn (1968) found that after mass mortalities of sea urchins on coral reefs the recovery showed a steady increase in numbers over a year's time. More motile organisms, such as the fish, would return much sooner of course. In the unlikely event that the Turkey Point plant discharge did cause recognizable biological damage in Card Sound, corrective action would be promptly initiated. Following this, the dynamics of the estuary would bring the biological structure of the affected area to equilibrium within a year.

Field studies begun by Florida Power & Light Company in 1968 give no indication that temperatures of 95°F are harmful to aquatic life.

Dr. Charles B. Wurtz

It is obvious that comprehensive field studies are badly needed. Such studies must span both pre-operational and post-operational periods. Florida Power & Light Company fully intends to have such studies made. These investigations will be a continuation of work already begun and will be projected far into the future. The Company has repeatedly given assurance of the intent to pursue such a program. I am confident that such investigation will conclusively demonstrate that a transitory, warm-weather, 95°F discharge into lower Biscayne Bay will not cause biological damage.

Now, having heard Dr. Tarzwell speak yesterday, I would like to add some comments and respond to some general statements that he made.

Historically it is a matter of record that repeatedly biologists, ecologists and others associated with aquatic life have said that as the temperature of the water increases, its capacity to contain dissolved oxygen will lower, and as a result with increased water temperatures you have decreased dissolved oxygen concentrations.

Now, this would hold true under straight physical laws if we were dealing with pure water, and the only variable were temperature. This would indeed be the case. In point of fact, there are too many environmental factors that can affect the temperature on the water.

Now, referring to Table 1 of the report that was presented yesterday, if you take the maximum temperature given for each of the stations, and grant that were the maximum dissolved oxygen at each station, in theory you should have a negative correlation because as the temperature goes up the oxygen should go down.

Yesterday afternoon in sitting in the back of the room I developed a Spearman's Range correlation analysis for those data, and I come out with a Rolf value, which is the symbol used for correlation, of .509. There is virtually no correlation here. You have a value of .750. There's no correlation, and that which does exist, even if you want to consider this correlation, is positive rather than negative.

That is to say, as the temperature went up, dissolved oxygen went up. Dissolved oxygen content is not a function of temperature in this circumstance. The dissolved oxygen content is as a result of photosynthetic activity. As the temperature went up the phytoplanktons went up, and, therefore, more oxygen was produced by these organisms.

This is not an unusual situation. You can do this with data from virtually any body of water where aquatic life is present and come out with exactly the same thing. Very rarely do you find an increase in temperature associated with a decreased dissolved oxygen with any degree of correlation of any magnitude.

Dr. Tarzwell also referred to the fact -- and this is a perfectly justified thing to do. As the temperature is increased, and especially in the spring of the year, as the spawning system approaches, these organisms and particularly fish, which was Dr. Tarzwell's particular concern here, these organisms will spawn earlier.

Dr. Tarzwell projected to the point that if the fish spawn earlier and the eggs hatch, and the larval forms pass through the oosacstage and begin to form minute protozoa and minute organisms for organisms of the size. His argument was that these would not be present because it was out of season for them.

My argument is that if this temperature caused the early spawning in the fish, similarly marine life would spawn early, and the food organisms would be there. All you're doing is advancing the entire biological cycle by some period of time as a function of temperature increase.

Dr. Tarzwell also was hesitant about the volume of water anticipated being permitted discharge into Card Sound on the grounds that a new circulation pattern would be formed. I don't think there's any doubt but what a new circulation pattern would be formed to some extent.

I would advance the thought that this would be beneficial to Card Sound. The total area of Biscayne Bay in the northern part is a positive estuary with the run-off exceeding evaporative loss. The lower part of Biscayne Bay is a negative estuary where the lack of vapor exceeds the run-off, and we have unpublished records of salinity in Lower Biscayne Bay as high as 40 parts per thousand, which is higher than oceanic waters. This is a type of situation that they have at Laguna Madre off the coast of Texas.

With this discharge into Card Sound we would be diluting the increase of salinity effect, and I think this would be beneficial.

Dr. Charles B. Wurtz

The thought was advanced that the status quo of the circulation of Biscayne Bay as it exists today has persisted for some 3500 years. I would doubt this very much. I would suspect that if you went back and looked at the hurricane record on the East Coast of Florida you would find subsequent to each hurricane of any magnitude some changes in the circulation pattern of Biscayne Bay. There would be scouring of the bottom, and I think there would be changes in Biscayne Bay that are much abbreviated compared to 3500 years.

Dr. Tarzwell is also concerned about the putrefacation of Biscayne Bay, and as an example to illustrate what he had in mind, he referred to Lake Erie. I would point out that Lake Erie, contrary to the popular opinion advanced by some interests that it is a dead sea, it is quite to the contrary.

Commercial catch records from Lake Erie have been kept since 1879. I would point out in 1967 the commercial fishing catch in Lake Erie was in the ten highest years of the records kept since 1879.

It is true that there is a change in the composition of the fish that are being taken. No species, no fish or any organism remains constant over periods of time. It's cyclative. Populations build up. Populations decline.

Dr. Tarzwell also is concerned about the loss of life of planktonic organisms, larval forms, and so on passing through the condenser tubes. Dr. Lackey this morning has already pointed out that he has found no effect in Biscayne Bay to date of this phenomenon associated with the plankton structure as it now stands. I would point out that there were studies made in England of the passage of water, both fresh water and salt water, through generating stations. I don't recall the exact figure, but something in the order of 72 species of organisms. Snails of this nature went through the tubes without any damage except an occasional physical damage.

Dr. Allen Brook, of the University of Minnesota, began a study two years ago on the passage of organisms going through the tubes of the L & S Chemical Plant. Dr. Brook presented parts of his result on the hearing in Minneapolis. Among these results was the fact that he could find no loss of life by the passage of organisms through the tubes. The amusing thing to me was he was so surprised by it. He expected to see considerable destruction shown. I might add he has retained these organisms in a study-state condition. It is not a question of their dying after some period of time because this could be.

At the drop point plant in the vicinity of Washington, D. C., a statistical study has been made of a common marine organism, Arcatia. This study was made in an area above and in front of and below the plant. Presumably the volume of water going through the tubes, going through the plant, presumably would reduce the population of this planktonic copepod. In point of fact, they can find no significant difference in the population density of Arcatia above the plant, off the face of the plant, or below the plant. I do not believe that this work has been published.

Dr. Tarzwell has suggested that as an absolute maximum temperature for Biscayne Bay, 92°F. I suppose in a sense it is somewhat unfair to go back into the history of thermal problems in this country, but I would advance the thought that Dr. Tarzwell was the architect for the Orsanco group that permitted and recommended 93°F for the Ohio River in the northern states, and in 1957 Dr. Tarzwell published the water quality criteria and suggested 96°F.

MR. STEIN: Let me correct that. We just finished that in Ohio with Dr. Tarzwell. We just came back last week. The figure is 89°; not 93°. It is not 93°.

DR. WURTZ: I didn't catch the last part.

MR. STEIN: The figure is 89°; not 93°. I just came back from there.

DR. WURTZ: I'll withdraw it.

MR. STEIN: I don't think it is relevant. I don't think it is fair to go into it. It is not relevant to this, I hope. If we can, let's leave Ohio out.

DR. WURTZ: The point that I'm really trying to make, Mr. Stein, is that we do change as our knowledge advances.

MR. STEIN: That's right.

DR. WURTZ: I would observe in water quality criteria in the work of the National Technical Advisory Committee, and Dr. Tarzwell, as I recall, was chairman of the subcommittee on aquatic life. This particular publication in its forward or preface or kick-off very carefully points out that we know less -- that there is less known, if you follow me. In addition, every one of these things is put in there very carefully as a recommendation, as a suggestion. Not as a standard; not as a criterion, but just simply as a guideline, and that is all. It is not a fixed thing, and this, I'm sure, will change with time, just as Ohio has changed, Pennsylvania has changed, Dr. Tarzwell has changed, I have changed.

Thank you.

MR. STEIN: Are there any comments or questions?

I'm sorry. Let me say this. I apologize to Dr. Wurtz for breaking in, but I think that in the interest of time if we try to keep this to the Biscayne Bay operation we'll be better off. I know we have the same cast of characters throughout the country.

MR. THOMAN: I have a question of Dr. Wurtz.

MR. REED: I have a question.

I am confused, Dr. Wurtz, and let me tell you where I am confused. I gather that you -- I get an indication from you that we might be able to improve Biscayne Bay and Card Sound.

DR. WURTZ: With this recirculation pattern, Mr. Reed, yes.

MR. REED: In other words, what has taken 3500 years to create we can improve as man?

DR. WURTZ: I think this is true, sir.

MR. REED: Can you name me other bodies of water? I only see the inevitable result in Florida of what man has done to degrade the waters of Florida. I haven't seen a single sign of improved water in three years. Could you give me some examples of water where man by great public works has improved the quality of the water?

DR. WURTZ: The Schuylkill River that flows through Philadelphia.

MR. REED: That was a river that man had terribly damaged. Give me a body of water that is pristine in quality, absolutely pristine in quality, and tell me where man has improved it.

DR. WURTZ: Well, given a body of water that is absolutely pristine in quality you would by the definition not improve it.

MR. REED: Do you think Biscayne Bay is in good biological order, and in good pristine condition?

DR. WURTZ: Yes, I do. Mr. Reed, your concern --

MR. REED: I have to be concerned. I am Chief of the regulatory agency that has to take your recommendation. I have to take a gamble, Dr. Wurtz. You have got me frightened. Everybody has me frightened. I am going to have to make an evaluation of 95°, 93°, 92°, 89°, and I'm trying to find some way to justify my opinion on taking a chance. And as you well know, whatever temperature we choose we are going to be taking a chance, aren't we?

DR. WURTZ: Yes, but apparently I misled you, Mr. Reed. I did not imply -- at least I did not intend to imply that this improvement in Card Sound was the function of temperature.

MR. REED: This is going to be a change of volume. You are going to have a new type of current in Card Sound that is going to improve it?

DR. WURTZ: I would hope to see the salinity lowered to retain estuarine characteristics rather than as today, salinity doubled on the order and magnitude of oceanic waters.

MR. REED: Gosh, Doctor, you're asking me to change something that has been made by God. All I have seen is examples of something that man has changed which are disasters. You bring up fish population in Lake Erie. What about the fish in Lake Apopka? Is the fish population in Lake Apopka more desirable, even though there are more tons in Lake Erie than in Lake Apopka? Are they more desirable to man?

DR. WURTZ: Well, are you angling? Do you prefer to angle for trout or bass, commercial?

MR. REED: I prefer bass rather than angling for gar and shad.

DR. WURTZ: I do, too, admittedly. I would not the shad.

MR. REED: That is not the kind of shad you are thinking of. That is another kind of shad that you would get.

DR. WURTZ: It's a thought, Mr. Reed. We cannot live on the face of the earth without altering it.

MR. REED: That's right. But we have to be exceedingly careful. Haven't we learned that we have to be exceedingly careful when we alter something?

DR. WURTZ: This we try to do. I really don't mean to disturb you, sir.

MR. REED: I'm terribly disturbed.

MR. THOMAN: Dr. Wurtz, I want to praphrase what Mr. Reed is saying. Man, for social or economic good, has been performing works and modifying the environment until today we are almost faced with a crisis in the entire area, and we are faced with this crisis in certain places.

MR. REED: I would agree.

MR. THOMAN: Mr. Reed, and I, speaking for myself now, feel very strongly that when you have a body of water that is in the pristine condition that Biscayne Bay is that neither he nor I are going to sit idly by and see this altered in any way, shape or form unless we are completely 100 percent sure that the alteration is not going to change it.

Now, along with that I have got a couple of questions about your statement. One of them is that I am going to make one. You proposed a very interesting new theory about the solubility of oxygen, and it would be interesting to see what happens on this one. But in your statement on Page 6 you say that "Field studies begun by Florida Power & Light Company in 1968 give no indication of temperatures of 95° are harmful to aquatic life."

In essence, what that is saying is that our observations in June 1969 were complete and erroneous; that pictures which Mr. Purkerson showed yesterday obviously came from some place else, and the biological observations we made in this extended area at the exit of Grand Canal into Biscayne Bay were completely wrong. And I submit, sir, that an unfounded statement of three lines, as you have in your statement, certainly does not back up the detailed scientific investigations that are documented in our report.

DR. WURTZ: I seem to be developing an uncommon facility for an unhappy way of expressing my thoughts. I did not deny the data that has been presented by the FWPCA report. It so happens that I admit that I do not agree with the approach. I do not argue with the data.

When I said that the field studies indicate temperatures as high as 95° are not harmful, this is not to say that this was the maximum temperature down there. I am well aware of the fact that damage has been done, as Dr. Lackey has already pointed out, but not at temperatures of 95° or below.

MR. STEIN: I think, as I understand the Federal report, they indicated that we had damage at degrees of 92° and above. Now, of course, there may be a difference in your approach. This is a factual difference that the conferees will consider.

I want to see if I understand you because aside from one of the points, I think possibly we have a contribution here that you may have offered, Dr. Wurtz. Mr. Reed says we have so few places in the United States where we have untouched waters and so few places next to large cities.

For example, when we had the Wild Rivers hearing to preserve these -- we just had one near Minneapolis where they put up a powerplant at Stillwater. When the plant went up, there was no mixing zone allowed, and it was asked the temperature come back at ambient levels. The point is, if we get a situation, as we apparently have here, of two bodies of water such as Card Sound and Biscayne Bay, that have been left to us by geologic ages of creation, are we prepared to put in two -- almost three billion gallons of water a day and take a chance of what would happen?

As Dr. Lackey pointed out, you may not have the oyster in South Bay anymore, but we still have clams.

Now, are we prepared to do this kind of thing?

Or do the people of the State of Florida want to keep what they have to offer -- some of these natural waters that have not been touched by civilization?

DR. WURTZ: Well, I suppose in a sense I can only respond to that with sort of a philosophical attitude that you have presented. You, of course, and your associates, as conferees, literally are in the embarrassing situation of having to make this decision.

MR. STEIN: That is right. We need your advice.

DR. WURTZ: I do not envy you. But I would think that you must keep in mind, if you want to preserve Biscayne Bay as it is: you bloody-well had better close the borders of the State and cut off reproduction and everything else.

MR. STEIN: No, we don't have to do that. That is the old argument that we always had -- that we had to put diapers on ducks. Sir, here is the situation that we are faced with. I don't think this is an embarrassing position. I think this is a position of trust that we have. But here is the position that I find: Dr. Wurtz, let's try to think this thing through together.

Dr. Charles B. Wurtz

We have a bay like Card Sound, which has been relatively unchanged for thousands of years and has a very good aquatic population, and it gets very high marks from the aquatic biologists. The proposal is to put in 2.7 billion gallons of water a day at a temperature different than Card Sound has now.

You are suggesting that this might improve Card Sound. I think if you were sitting in my seat or Mr. Reed's seat, before you would take the chance of putting something like 2.7 billion gallons of water in a sound, just on volume alone, besides changing the temperature, you would want to be darned sure.

Secondly, where we have evidence by some biologists -- and, of course, some disagree -- that those temperatures would cause harm, I think you have to pause again. On the basis of what we have in your paper, with all due regard to your opinion -- and I'm not arguing with this at all, that this would improve it just taken on the bare statement or your opinion -- would you think that taking a step of this magnitude would be one that public officials, such as Mr. Reed, Mr. Patton or myself, can reasonably consider on what you have given us? Really?

DR. WURTZ: I have in a sense, I suppose, tried to -- where we have to make a decision in these matters, and in point of fact have made a decision, and in substance what I presented, I hopefully have taken into consideration all of these factors and have come out with what I think is a proper conclusion.

Now, I would ask you to consider that once again, I have not said that temperature was the improving item in this Card Sound. It was the interjection of 2.75 billion gallons of water per day that had a lower salinity than prevails at times in Card Sound. And, once again you can see this salinity difference in the FWPCA report between Tables 3 and 4.

MR. STEIN: Sir, no one is arguing with the factual statement. The thing that scares me is the volume of this water coming in and as some of the biologists, which say, may change the flow patterns in the bay and not let ocean water come in and have the kind of mixture that it has now. Now, this will very probably change the characteristic, because I think you have said what I believe is substantially correct. You said, "In the unlikely event that the Turkey Point plant discharge did cause recognizable biological damage in Card Sound --"

You indicate that this might happen. Some of the people think that it will happen. You think "corrective action would be promptly initiated." What corrective action would be taken?

DR. WURTZ: Mr. Stein, I have to assume that the people that I represent when they tell me something they say it in good faith, and intend to fulfill it. I have no idea what corrective action might be taken.

MR. STEIN: That is why, as far as I'm concerned, your statement is opinion. The problem that we are faced with, Dr. Wurtz, is this: Once that plan goes on the line, and once 2.75 billion gallons of water go in there a day, I don't know how we are going to get corrective action properly initiated when we have so much problem getting going.

If the issue then becomes that, if you want to stop the water, then the people are not going to have electricity. I can see that we are going to have some severe problems.

Now, I'm not disagreeing with what you say, but when you say "corrective action would be promptly initiated," this is an assumption that you are making in the field that's beyond the perview of your expertise.

DR. WURTZ: I am reflecting what I have been told, but I have heard nothing to contradict this, Mr. Stein. The only engineers that I have heard discussing this have been the engineers who have, in fact, been associated with the construction of this. There has been no other engineering opinion presented anywhere.

MR. STEIN: You spoke about the Schuylkill River. Whenever we have corrective action, it is my experience it has taken years. But then you say, "It is obvious that comprehensive field studies are badly needed. Such studies must span both pre-operational periods. Florida Power & Light fully intends to have such studies made. These investigations will be a continuation of work already begun and will be projected far into the future." Let's assume you feel the studies are made, but you believe that we need more information in order to come up with definitive judgments. Now the point is, if you believe the studies are made, the implication for the people sitting at this table is this will mitigate against the approval of a reconstruction and operational program, which will change the facts of the situation before all the information, you see, is necessary.

Again, let's go back to what Mr. Reed said. On the basis of what you have said, it seems to me that you have given the best argument I have heard so far for not tampering with what is going to happen in Card Sound until all the facts are in. That is how I read your conclusions.

DR. WURTZ: I have to admit that I have the facility to mislead you.

MR. STEIN: You have helped me quite a bit. I appreciate your testimony.

MR. PATTON: Mr. Stein, I have a couple of questions to ask of FWPCA. I notice in the tables 1, 3 and 5 they have certain figures listed there. I would like to ask if they have seen any other data towards salinity which would indicate values approaching those mentioned by Dr. Wurtz. The highest I see on Card Sound is on Table 5 which is 17,500, which would be 17½ parts per hundred.

MR. THOMAN: Mr. Hagan.

MR. HAGAN: I think the problem here, Mr. Patton, is that we are comparing apples with oranges.

MR. PATTON: Would you explain that?

MR. HAGAN: Our report is based on milligrams per liter of chloride; whereas Dr. Wurtz's statement was in parts per thousand of salinity. These are not directly comparable units. There is no basic disagreement. Seventeen parts per million of chloride converts roughly to --

MR. PATTON: Seventeen per thousand.

MR. HAGAN: It converts roughly to 28 to 30 parts per thousand of salinity, I believe.

MR. PATTON: But the numbers that you have are indicative of ordinary sea water, somewhere in this range?

MR. HAGAN: Seventy-five to eighty percent sea water. That is quite close.

MR. PATTON: One other question, Mr. Hagan, before you go back. In these tables I notice you allege temperature rise, and for each of the stations you have a miximum, minimum and average. Do the maximum temperatures, for example, correspond with the maximum dissolved oxygen?

MR. HAGEN: Not necessarily. Not necessarily.

MR. PATTON: Thank you.

DR. WURTZ: I would like to add something, if I may. I appreciate what Mr. Patton is bringing forth here, and I appreciate what Mr. Hagan has presented.

But I bring to your attention, Mr. Patton, that the Card Sound data report represents one day's sampling of January 15 of this year. I don't know that this was necessarily a period of high evaporative loss from Card Sound.

MR. PATTON: True. Do you have some additional data that you can present?

DR. WURTZ: No, sir, I do not, not at this time.

Actually, this is one of my concerns of the FWPCA report. All the water quality data presented embraces 2 periods of 3 days each, in tables 1, and 3, plus the one today, which is reflected in Table 4 for Card Sound. This is an awfully brief period of time for studies. We are talking about 6 sampling sites off Turkey Point, 4 sampling points in Card Sound, a top and bottom sample out of something in size of Biscayne Bay. This is very, very limiting. You know this as well as I.

MR. PATTON: Doctor, I am too well aware of it. I have been aware of it for years. We have to operate, unfortunately, in the same manner that the FWPCA in covering many waterfronts.

DR. WURTZ: This is pretty much the spot we are all in. Florida Power & Light has to operate in the framework of Dade County's permit system.

MR. PATTON: Let me say one thing further. If you go back in time you will find, although the reports have been brief and sketchy, they have been surprisingly representative in the long haul.

DR. WURTZ: I'm willing to accept your word for this. I think there is a great deal of homogenity in the bay.

MR. THOMAN: Dr. Wurtz, you indicated in your statement -- and I presume Florida Power & Light Company has read this statemrnt prior to your presenting it -- but does the Florida Power & Light Company have any better data on Card Sound on water quality than we presented in our report?

It says here that these investigations will be a continuation of work already begun and will be projected far into the future.

DR. WURTZ: Now, I can't answer, Mr. Thoman, because the work being done in the interest of Florida Power & Light is being done by several people, and I am not associated with them.

MR. STEIN: Dr. Wurtz, I thought I said this before. I think Mr. Patton and Mr. Thoman are saying the same thing. If your contention is correct -- and I do not dispute this because we have the problem, as Mr. Patton pointed out, we do not have a super-abundance of data -- is your criticism of the Federal and State work that it does not have that super-abundance of data? We also have to ask if we are going to engage in a tremendous public works project and have a change in the area by putting 2.75 billion gallons of water in the area a day, then it seems to me that the burden is neither on the Federal people nor the State people.

If within our resources we have the examination and indicate that we have some substantial doubts and conclusions, it seems to me that the burden is upon the people who want to construct the work and change the ecology to tell us that this will not change it.

Now, on the basis of what you say, it is your opinion that continual study is necessary before we can come up with it. Therefore, you are persuading me that if we don't have this, really we are doubtful in going ahead.

I frankly thought that the industry had some better data and was more sure. I am a little shaky here that we really don't know what is going on. Before we press the button to authorize the realese of 2 billion or 3 billion or 7 billion gallons of water per day into this fine bay -- and I think I can speak for the panel -- we are going to have to be pretty much reassured what is going to happen.

Are there any further questions or comments? If not, thank you.

DR. WURTZ: Thank you, sir.

MR. STEEL: Mr. Chairman, our next witness will be Dr. Gunter.

DR. GORDON GUNTER, DIRECTOR,
GULF COAST RESEARCH LABORATORY,
FLORIDA POWER & LIGHT COMPANY,
OCEAN SPRINGS, MISSISSIPPI

DR. GUNTER: My name is Gordon Gunter. I was born in Natchitoches Parish, Louisiana, in 1909. I obtained the Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees in zoology. I have worked all my mature life in the field of fisheries and marine biology. I worked for the Federal Government, and at least as a consultant to every State government on the Gulf Coast.

Dr. Gordon Gunter

I began in 1931 and have been Director of the Institute of Marine Science of the University of Texas, and I am now Director of the Gulf Coast Research Laboratory in Ocean Springs, Mississippi. I carry professorships in the three State universities. I have been in every bay on the Gulf Coast of the United States with one exception.

I have been particularly concerned with temperature and salinity, and I have published several research papers on these matters as they concerned seasonal cycles of marine animals. I am submitting herewith a summary biographic statement.

MR. THOMAN: Let me note for the record your biographic statement will be accepted and kept in the records of the conference.

(The above-mentioned biographic data, marked Exhibit No. 1, is on file at Headquarters, FWPCA, Washington, D. C. and the Regional Office, Atlanta, Georgia.)

DR. GUNTER: Thank you.

Comments on Water Temperatures: The highest temperatures taken in the open bays of the northern Gulf of Mexico consistently run 34.8 - 34.9°C, which is approximately 95°F. I found such temperatures in Arkansas Bay, Texas, 30 years ago (Gunter, 1945), and Hedgpeth (1947) found temperatures of 33 - 35.0°C(91 to 95°F) "not rare" in the Laguna Madre of Texas.

The Laguna Madre is a high temperature, high salinity coastal lagoon, and I pointed out years ago that it produced more fish than any other area of the Texas coast. Hedgpeth (1947) quantified the matter and showed that it produced 52 percent of the commercial fish catch of Texas from 1941-1945, although it extended along only 20 percent of the Texas coastline.

For the past 3 years, we have been carrying on work at 45 stations in Mississippi Sound. At 42 of these stations the highest temperature registered was above 30.0°C (86.0°F) in June, July and August; 33 times it exceeded 31.0°C (87.8°F); 20 times it equaled or exceeded 32.0°C (89.6°F); 11 times it exceeded 33.0°C (90.4°F) and 3 times it equaled or exceeded 34.0°C. Those are natural temperatures.

We have taken temperatures of 32.0°C (89.6°F) in the open ocean, many miles from land. The highest temperatures found at the above stations fell below 30.0°C only 3 times. These readings were 29.6, 29.0 and 29.5°C. (About 85°F).

Dr. Gordon Gunter

A nice little graph can be drawn showing virtually a straight-line relationship between the number of readings and the temperature, declining from greater than 29.0° to greater than 34.0°.

At one station where a powerplant empties into upper Biloxi Bay we have taken a temperature of 37.1°C (98.8°F), but the average temperature over the whole water column was 33.8°C in August, which is nearly always the hottest month. We have been watching this situation for 3 years now and the area remains productive.

Thus under natural conditions you have temperatures higher than 34° in the Gulf Coast bays fairly often and up to 35°C in some of them. In waters where the water is artificially heated to 37.1° occasionally there is no noticeable decline in the animal population. Thus the temperature limit of 35°, as set by the Dade County Pollution Control Hearing Board, is reasonable, in my opinion, and anything lower would necessitate the cooling of coolant waters below some natural temperatures of the bays in some months.

The present flora and fauna at Turkey Point and the surrounding area is in a lush and thriving condition. I looked at it in January, and I suspect that the warm water led to an efflorescence of the sea grasses in this area during the winter. The statements that the present Turkey Point operations have ruined the area are simply incorrect.

As far as my observations go, that concludes my statement, gentlemen.

MR. STEIN: Any comments or questions?

MR. REED: Mr. Chairman, I had the privilege of hearing Dr. Gunter at many hearings in the State of Florida. I have no comments or statements.

MR. THOMAN: I have a comment, Dr. Gunter. All the data which you have cited pertained to the Gulf of Mexico. Biscayne Bay is on the Atlantic Ocean?

DR. GUNTER: Yes.

MR. THOMAN: In the Gulf of Mexico there is a shelf that extends out varying distances, 30, 40, 50 or more miles. I submit that the temperatures in the Gulf of Mexico are substantially different than temperatures in the Atlantic Ocean, which is the subject of this conference.* I also want to thank you, sir, for mentioning this powerplant in Biloxi. It appears that the temperatures that you have cited are in violation of the Mississippi State and United States water quality standards. I assure you that next Monday it will be called to the attention of the appropriate Mississippi State officials for such investigation or remedial action under the water quality standards indicated.

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* See appended rebuttal after close of conference.

DR. GUNTER: I'll tell you. I don't know what your standards are, nor really how these standards have been promulgated. I must say that they have never been brought to our attention. Of course, my laboratory is not an enforcing agency.

I might say, however, that I was asked by the Department of the Interior not long ago about the possibility of putting in an atomic powerplant on the Mississippi coast. They are trying to think of a lot of things to help out that area following Camille.

I told them at that time that all the evidence that we had showed that if it did not get above 35 with their water that it would be all right, as far as we knew.

Now, the area that you are talking about has remained productive all the time throughout these 3 years, and even if they did violate a time or two, I don't know what that temperature was, and I don't know what the violation is.

I might interject one more thing here in answer to Mr. Reed and his question to Dr. Wurtz, one of them. It is my considered opinion that throughout the years the Mississippi coast has become more fertile and more productive than it was before.

Now, I can't prove that on the basis of fish production commercially because it's going up all the time, but nobody can say that we were catching full potential in the old days. The sports fishing is increasing at a great rate, and I think that actually we are getting a little hyper-fertilization in there, which is leading to an increased production.

Now, the question is when are we going to hit the danger point, if this assumption is correct? I might say, also, that our oyster production is going up, etc., but in a lot of the areas we cannot use the oysters on account of sewage pollution. We would be quite happy to have you come over there and straighten it out anytime that you can.

MR. STEIN: Doctor, we have been there. It would be difficult to find the public hearings where we weren't on all the television stations and the front pages of the paper. It seems to me the last 2 weeks there's great improvement that we have had in the Gulf Coast. We have been on Pensacola Bay, Escambia Bay, Mobile Bay. And every place we found cases of gross pollution the Federal Government and the State said that it had to be corrected. I think the industries and cities are going along.

I am sure, Doctor, that we all know that oysters thrive on polluted water, and in garbage and discharge. The difficulty that we have and the people have is when they try to eat those.

DR. GUNTER: That is right. But oysters do not thrive alone, sir. They thrive along with other life.

MR. STEIN: That is right. Now, may I just say before you finish, I have heard testimony about the Federal report being erroneous. I can't understand comments such as this. Why you say it is erroneous, and say it is not so and it is wrong.

I believe there was some data presented in the Federal report, and there were some pictures presented in the Federal report, which I think raises at least some presumptive conclusions. But, to add the statement that at the present Turkey Point operation has ruined the area are simply incorrect. If you think that this is the kind of refutation allegedly that is going to cause the falling of the Federal report, that may be your view, but I haven't seen anything that has gotten into substantive arguments of what the report says, what the views are as to why it is incorrect, or what the correct facts are.

DR. GUNTER: If you will go back and look at the Dade County report of -- of course, my report is short. I'm trying to get through. I went there and looked at the area, and it is a fairly rich area under present conditions.

Now, if it were ruined, the hot waters going in there and still ruining it, I think it would be dead. When it comes back and is in a healthy condition, as far as anyone can see, compared to any bay in Florida now, then the simplest explanation is either that this huge kill did not take place over much of an area, or there is a summer die-down during which time we cross examine, and now it is back again.

MR. STEIN: Are you contending that the Federal people who indicated that kill that took place gave us wrong information on the area that the kill took place over?

DR. GUNTER: I'm not contending anything of the sort, because I'm telling you what I gave and what I saw, and it is all there. Now, somehow or another all of this information has to be complemented, so to speak, by you gentlemen.

I think that you can take a look at it and see.

MR. THOMAN: Sir, I have been visiting that area since 2 years ago this February, when we went through the whole place. By your own admission, you did not see it last July; so I don't see how you could comment what the conditions were last July.

DR. GUNTER: I said assuming that the reports were correct last July, the situation has changed greatly, and probably the warm water brought about an efflorescence during the cooler months. That is the simplest explanation that I can see.

MR. STEIN: All right. Again I think I understand you, but I don't know.

DR. GUNTER: Do you think the efflorescence is not there at present?

MR. STEIN: I didn't say the efflorescence was not there at present. I just don't understand what you're driving at if someone says there's a die-off in the summer months and --

DR. GUNTER: Let's say it is not permanently wiped out. Would that satisfy you? It is not permanently wiped out.

MR. STEIN: I have been in pollution cases over and over again where we clobber a stream or a body of water during the critical period, and life being what it is on this planet it comes back. This is the essence of pollution control. If the argument is that during the peak period we can wipe out the biota because nature is going to have to come back sometime, if you believe that that's the kind of state of affairs we should go along with, and that we should O.K. a project that is going to do that, I'm glad to have your view.

DR. GUNTER: I gave you an explanation, which is the most reasonable one that I can see, for that divergence in the testimony.

MR. STEIN: Thank you.

Dr. Robert G. Dean

MR. STEEL: Our next witness will be Dr. Dean.

MR. REED: Do I have a card on Dr. Dean? Bob, did you sign card?

DR. DEAN: No, I didn't. I presumed the Florida Power & Light Company did it.

I have a prepared statement that I would like to read, and then also I would like to add to that statement, if I may, in accordance with some of the discussions and statements that were made yesterday, and I presume the best way to do this would be to first read the statement and then make any additions. Is that correct?

MR. REED: All right, if you would as quickly as you can.

DR. ROBERT DEAN, CHAIRMAN,
COLLEGE OF ENGINEERING, UNIVERSITY OF FLORIDA,
GAINESVILLE, FLORIDA

DR. DEAN: My name is Robert G. Dean. My academic training includes a Bachelor of Science degree in civil engineering from the University of California at Berkeley; a Master of Science degree in Physical

Oceanography at Texas A and M University, and a Doctor of Science Degree in civil engineering from the Massachusetts Institute of Technology.

For the past 10 years, I have taught and conducted research in coastal engineering and nearshore oceanography. At present I am Chairman of the Department of Coastal and Oceanographic Engineering at the University of Florida, Gainesville, Florida.

During the past 18 months, the Department of Coastal and Oceanographic Engineering of the University of Florida has been conducting studies related to several aspects of the Turkey Point facility. Specifically, our studies have been directed toward: 1) The prediction of temperature fields in the discharge canal and in Card Sound, and 2) the evaluation of temperature recirculation for various discharges. Portions of this research were presented in a report "Recirculation and Temperature Field Considerations: Turkey Point Facility" issued in May 1969.

Results of studies conducted subsequent to that date have not been formally reported; however, a considerable amount of additional results have been developed. The significant features of these additional results will be summarized in this statement.

Dr. Robert G. Dean

Temperature Fields:

Temperature fields have been calculated for the proposed discharge canal and Card Sound based on climatological data and measured water temperatures of August 1968 and August and September 1969. These calculations consider the intake water temperature to be that measured in Biscayne Bay and that with a 15°F temperature rise across the condensers and 150 percent dilution, the temperature is 6°F above ambient at the upstream end of the discharge canal.

1968 Climatological Conditions:

Based on August 1968 water temperatures in Biscayne Bay as measured by the Federal Water Pollution Control Administration, the maximum predicted temperature in Card Sound is 94.6°F. A temperature of 94°F would have been exceeded a total of 30 hours during the month of August. Complete statistics of the August 1968 predicted temperatures are available.

1969 Climatological Conditions:

Based on August 1969 water temperatures in Biscayne Bay, as measured by the Department of Coastal and Oceanographic Engineering and Federal Water Pollution Control Administration, the maximum predicted temperature in Card Sound is 94.8°F.

Dr. Robert G. Dean

Discussion of Temperature Calculations:

The estimated accuracy and the conditions for which the temperature calculations were conducted are important in the evaluation and interpretation of these results.

The accuracy of the calculations is believed to be within ±0.8°F. It is also believed that the calculations predict temperatures which are somewhat high due to the observed tendency for colder water to be drawn into the plant intake through the relatively deep navigational channel extending from the vicinity of the intake structures about 3 miles to the northeast.

The temperature rise for which the calculations were conducted (15°F) is considered to be an absolute maximum. One control on the temperature of the discharged water would be to simply limit the amount of electricity produced if experience indicates that temperatures in Card Sound would rise above 95°F.

With regard to temperature recirculation, temperature recirculation from the proposed discharge point in Card Sound to the intake in Biscayne Bay has been investigated by means of 1) approximate theoretical calculations, and 2) a small scale hydraulic model.

The results of the temperature recirculation studies indicate that there will be no significant temperature recirculation for the planned discharge canal intake system up to discharge values of 10,625 cfs (corresponding to 150 percent dilution). The reduced recirculation is due in part to the greater time required for a water particle to travel from the discharge point to the intake point, calculated to be approximately 4 to 5 days, and in part to greater mixing.

I'll make a statement now. This is one of the points that I would like to come back and discuss later on. I have some pictures here of the hydraulic model that we used.

MR. STEIN: These will be accepted without objection as exhibits.

(The above-mentioned pictures, marked Exhibits Nos. 2, 2a and 2b, are on file at Headquarters, FWPCA, Washington, D. C. and the Southeast Regional Office, Atlanta Georgia.

Dr. Robert G. Dean

DR. DEAN: Basically, if I could digress a moment. Basically, the model includes that area starting at the north about 1 mile north of Turkey Point and extending about 1 mile south into Barnes Sound; that is, south of the new Card Sound bridge.

The model has the capability of representing tidal motions within the encompassed system, both Islandia and the appropriate tidal lags. It also has the capability of including either the present plant cooling water system or the proposed plant cooling water system. Basically we investigated the recirculation potential of the proposed system, and also had a check because we were able to determine whether or not the model predicts realistic recirculation values for the present setup, and, of course, these are available.

I would like to comment briefly on one aspect of the recent FWPCA report which has subsequently been modified. This is Conclusion 9 in the report. Perhaps I should read that just to be very clear. Reading from page 3, Conclusion 9:

"If the waste from the Turkey Point facility is discharged to Card Sound, as presently proposed by the

Florida Power & Light Company, temperatures in excess of 95°F can be expected at least 35 percent in Card Sound, 5 percent of the time."

I would like to describe to you the origin of that statement. The origin of that statement, I believe Mr. Hagan can correct me if this is incorrect, it is from a report which I prepared and which was issued in May of 1969. The temperature calculations have since been modified for the following reasons: At that time --

MR. THOMAN: Dr. Dean, let me interrupt right here to say that you are correct in assuming that it came from your May 1969 report, but since that time the basic information on which your projections have been made subsequent to that were changed.

DR. DEAN: That is correct. That is the point of my statement. The basis for the temperature calculations here were not measured bay water temperatures but were predicted bay water temperatures.

By this I mean we took the standard temperature calculation procedures, and the climatological data as measured by Florida Power & Light, also by the United States Weather Bureau, and calculated the temperatures in the Bay.

Dr. Robert G. Dean

Now, I don't know the reason why the procedure as I just outlined predicts temperatures too high, but it clearly does. If you wish to check it, it is not a difficult point to check. My report -- and incidentally this was sent to the people that Col. Davis indicated on June 30 of last year, I believe.

Figure 5 in that report shows the average daily predicted bay temperatures at Turkey Point. The highest value predicted was on about August 16 or 17. It was 92.7°. This is an average daily temperature. The average highest temperature measured by FWPCA in the same month, August 1968, outside the zone of the plant influence was 87.7°. This is in their report, the appendix to the present report.

The result of this is that for 1968 and 1969 we now have revised predictions that indicate that temperatures at the canal terminus in Card Sound would not exceed 95°. They would be 94.6 and 94.8 for August 1968, and 1969 respectively. The other difference was pointed out yesterday.

I will just mention that Florida Power & Light is now planning 150 percent dilution. The report, of course, is based on 100 percent dilution.

Dr. Robert G. Dean

I would like to add one further statement on the term that Mr. Stein coined yesterday which was "velocity pollution." I would like to reduce this a little bit to a number so we have something to talk about. The rate of flow or the velocity in the proposed canal will be approximately 2 feet per second. At a radius of 350 feet from the discharge point in Card Sound, the average velocity due to the plant would be down to about 1 foot per second. At a radius of 3500 feet from the discharge point, which is about 7/10 of a mile, the average velocity would be down to .1 per second. This is about 1/3 to 1/4 of the peak tidal flow, the semi-diurnal tidal effects.

At least it gives us some base to compare. It is a large area, which is the point.

Let me just comment on the scour at the canal outlet. This, with proper design, expulsion of the velocity at the terminus at Card Sound can be reduced toward the 2 feet per second, which is planned for the canal proper.

That's all.

MR. STEIN: Thank you. Are there any comments or questions?

MR. REED: Yes.

Dr. Robert G. Dean

Dr. Dean, have you examined the present flow from the Turkey Point plant discharge?

DR. DEAN: Yes, sir.

MR. REED: In your opinion, is any of the damage on the bottom caused by the flow?

DR. DEAN: You are speaking just outside the terminus?

MR. REED: Yes, in the 600 acres outside the terminus of the discharge canal.

DR. DEAN: My examination there has been, I suppose, rather from primarily a personal interest point of view. I haven't really studied this. It does appear that there are areas of silting at present. These are clear from some of the aerial photographs.

MR. REED: I have seen them, and I have seen them on the spot.

DR. DEAN: It also looks like somebody has been scurrying in the peat-like material. I haven't examined it. This could be from high velocity.

MR. REED: When you had the hydraulic model made, did you study any of the other problems of circulation besides the problem of recirculation up to Biscayne Bay?

DR. DEAN: There are some limitations on the use of that model, which are imposed by the area that it encompasses. I think you are talking about the flow out into the ocean and total circulation.

MR. REED: That is what I was going to get to.

DR. DEAN: No, we didn't. The model is not capable of representing that.

MR. REED: Can you give me an opinion of if it is only 1/3 of the tidal flow?

DR. DEAN: We are speaking of velocities.

MR. REED: What will the effect of the speed of that be on the normal fluctuation of Card Sound?

DR. DEAN: Could you make it more quantitative, because I really don't know where to start on that.

MR. REED: Well, can you give me a fine engineering prediction after examining this, and after building the hydraulic model, as to what the long term results would be of a discharge of this quantity of water into Card Sound? Are we going to have the same kind of Card Sound that we have now, or are we going to have a different kind of Card Sound? From a hydraulic standpoint, not biological, what kind of Card Sound are we going to have?

Dr. Robert G. Dean

DR. DEAN: If we go to the east to Angelfish Creek and Broad Creek, which are the two outlets to the Atlantic Ocean on the tidal flows there, the discharge east that we have calculated there, we have made some measurements, but we haven't made comprehensive enough measurements to define that completely. We calculated there's approximately 50,000 cubic feet per second flowing in on the peak flood flow. This compares with the 4250 or so cubic feet per second for the plant without any dilution. My thought about this, my belief is --

MR. THOMAN: Dr. Dean, you said 40 to 50?

DR. DEAN: I said 4250, 4,250. My belief is that basically the flood flows through these two inlets will be reduced. The ebb flows will be increased, and one can summarize this and say there will be a net seaward discharge superimposed upon the present diurnal flows.

MR. REED: Will we experience it occurring in those small rivers going out to the sea?

DR. DEAN: In Broad Creek at least. It is a hard bottom.

MR. REED: We have had some dealings in this administration with Anglefish.

What do you think the differences will be, long-term differences, Bob? Do you think we are in a serious problem of changing the hydrology of this bay?

DR. DEAN: I think that any serious results would be in the biological domain where I am not really competent to comment.

MR. REED: But from a hydraulic point you don't see any problem in hurricanes, tides or water getting locked in the bay on a big flood tide with more water coming in from the canal? It is such a small percentage that it is meaningless, or a very small percentage of the problem of the bay?

DR. DEAN: I would say that I don't see any well defined problems. I can imagine little problems, but I think they are on a 1 or 2 percent scale, hydraulically speaking.

There will, of course, be some flow back to Biscayne Bay because we are raising the water level very slightly in Card Sound, and reducing it very slightly in Biscayne Bay. We have a hydraulic radiant to Biscayne Bay, but again this is a small quantity.

MR. REED: Thank you, Bob.

By the way, do you want a copy of the printed record?

DR. DEAN: Yes, sir, I would.

MR. STEIN: Are there any other comments?

MR. PATTON: Yes, sir. On Page 3, Dr. Dean, under 1968 climatological conditions you say that the temperature, 94° would have been exceeded a total of 30 hours during the month of August. Could you tell me approximately how much it would have been exceeded and for how long a period of time?

DR. DEAN: Well, it would be between 94 and 94.6, which was the peak. So that is the range.

MR. REED: It didn't get up to 98?

DR. DEAN: It says the peak was 94.6. It has to be between 94 and 94.6.

MR. PATTON: One other question. On Page 4 you say: "One control on the temperature of the discharged water would be to simply limit the amount of electricity produced if experience indicates that temperatures in Card Sound would rise above 95°F."

Is this commitment from the company, or a statement from you as to something that might occur?

DR. DEAN: I am saying this is a technical alternative or operational alternative. That is not my realm.

MR. STEIN: Since that was brought up, if I may, this is precisely why I want to ask the question because I think this is the crux of what you have said. Your statement has been very helpful if we are going to have an outfall. If it is going to affect the biology, then, I think we have to think about the vast amount of water going into it. I think that the question that we have is relatively simple, as you have stated on the theory.

Let me get to this because this is the key to what we are facing. "One control on the temperature of the discharged water would be to simply limit the amount of electricity produced, if experience indicates that temperatures in Card Sound would rise above 95°."

Now, maybe our people will say 92°, and you say 95°, and maybe there would be an outflow that can be controlled. It is easy to say theoretically that one control would be to simply limit the amount of electricity produced.

I submit to you that this is precisely the problem faced by the conferees. We do not believe, at least I don't believe that socially once you throw the switch that you can simply limit the amount of electricity produced, and this is the simple solution. It would seem to me before you start up that you would want the assurances that you are not going to get the damage, rather than to go into production and then say, if you are going to have damage in a place like Card Sound, you are going to cut back electricity.

Thank you.

MR. STEEL: Our next witness, Mr. Chairman, will be Dr. Gordon Dunn.

DR. GORDON E. DUNN,
FLORIDA POWER & LIGHT COMPANY,
CORAL GABLES, FLORIDA

DR. DUNN: Mr. Chairman, conferees, I would like to read a prepared statement on allegations that adverse meterological effects will result from Florida Power & Light cooling canal discharging into Card Sound.

My name is Gordon E. Dunn, former Director of the National Hurricane Center in Miami for 13 years until my retirement in 1968, after 43 years service with the United States Weather Bureau.

Dr. Gordon E. Dunn

I possess a BA Degree from George Washington University, and an Honorary Doctor of Science Degree from the University of Miami.

I have served three terms of 3 years each as Councilor of the American Meteorological Society, and I am a Fellow of the American Meteorological Society, and Past Chairman of the American Meteorological Society on Tropical Meteorology.

I am co-author of the book "Atlantic Hurricanes," and was responsible for the articles on Short Range Weather Forecasting and on Tropical Cyclones for the Compendium of Meteorology. I have contributed numerous articles for the various U.S. and foreign meteorological journals.

I have heard, read and considered all testimony on September 2, 1969, before the Circuit Court of the Eleventh Judicial Circuit in and for Dade County, Florida, and before the Dade County Pollution Control Hearing Board on January 14, 1970, and February 19, 1970. I find no basis for any contention that the proposed Florida Power & Light Company cooling canal, discharging into Card Sound, will cause significant weather modifications to that area or any climatological change.

MR. STEIN: I don't want to cut you off, but I don't think anyone here has contended that that would happen, and I am not sure that this conference called under the Federal Water Pollution Control Act has jurisdiction over significant methods of modification of climatological change except as it would affect pollution control, and no one has contended that, as far as I know.

MR. REED: I want to accept the report, and let him go because I don't think it has any basis on this.

MR. STEEL: Mr. Chairman, may we file it with the reporter, please?

MR. STEIN: Yes.

(The above-mentioned statement in its entirety follows.)

COMMENTS ON CLAIMS THAT ADVERSE METEOROLOGICAL EFFECTS WILL RESULT FROM FLORIDA POWER & LIGHT COOLING CANAL DISCHARGING INTO CARD SOUND

by
Dr. Gordon E. Dunn, Director
U.S. Weather Bureau, Miami, (Ret.)
February 24, 1970

My name is Gordon E. Dunn, former Director of the National Hurricane Center in Miami for 13 years until my retirement in 1968, after 43 years' service with the U.S. Weather Bureau.

I possess a BA Degree from George Washington University and an Honorary Doctor of Science Degree from the University of Miami.

I have served three terms of 3 years each as Councilor of the American Meteorological Society, am a Fellow of the American Meteorological Society and Past Chairman of the American Meteorological Society on Tropical Meteorology.

I am co-author of the book "Atlantic Hurricanes" and was responsible for the articles on Short Range Weather Forecasting and on Tropical Cyclones for the Compendium of Meteorology. I have contributed numerous articles for the various U.S. and foreign meteorological journals.

I have heard, read and considered all testimony on September 2, 1969, before the Circuit Court of the Eleventh Judicial Circuit in and for Dade County, Florida, and before the Dade County Pollution Control Hearing Board on January 14, 1970 and February 19, 1970. I find no basis for any contention that the proposed Florida Power & Light Company cooling canal, discharging into Card Sound, will cause significant weather modifications to that area or any climatological change.

The principal possible adverse meteorological effects resulting from the warming of water in Card Sound due to discharge from the proposed canal and from air passing over the canal itself, would be (1) an increase in precipitation, and (2) an increase in fog. It is noted, however, that no one, to my knowledge, has claimed that the increased precipitation, if it should occur, would be harmful or damaging.

So far, I cannot find that anyone has made any serious attempt to calculate mathematically the effect of the probable heating of Card Sound on weather. The complexity of the interaction between water and atmosphere and the state of the art in weather modification makes this understandable. One can only forecast what will happen on the basis of more or less analogous situations and experience.

If the air movement is 10 mph and normal to the canal, an air particle would spend approximately 15 seconds over the canal, much too short a time for it to accumulate a significant amount of heat or moisture. This would also be true even if the air particle passed over the canal at an oblique angle. Thus any possible meteorological effect of the canal itself can be dismissed as negligible.

It has been asserted that rainfall would increase based on an analogy of what happens on the southeast shore of Lake Erie in winter. The analogy is not valid because meteorological and areal conditions are very different. Lake Erie is some 300 times larger than Card Sound and in winter much warmer with respect to the air passing over it that Card Sound will be relative to the air passing over it.

From the standpoint of terrain and meteorological conditions, a better analogy to the effect of the proposed heating of Card Sound on rainfall can be found here in Florida. During the summer, at night, Lake Okeechobee is more than 10°F warmer than the surrounding land areas. Lake Okeechobee is about 50 times larger than Card Sound, yet radar and surface observations indicate that this heat source fails to induce any significant precipitation.

Weather Bureau wind records show that about 50% of any possible precipitation producing effect of Card Sound would be carried out to sea. In August, a typical summer month, these same records show that the wind blows from any particular direction -- southeast for example, no more than 10% of the time. This means that if the highly speculative assumption is true that a cloud street will be formed downwind from Card Sound, focusing showers in the area under this street, at the expense of adjacent areas, the normal variability of the wind will place the areas of increased and suppressed precipitation in one place today, another tomorrow, and still another the following day, averaging up over a period of time.

To produce fog, air must be cooled. Conversely, if the air is warmed, fog will dissipate or will not form in the first place. Thus the effect of the warming of Card Sound, if any, on the formation of fog would be to reduce it. Research on fog formation by Air Force, Eastern Airlines and the Weather Bureau meteorologists, all indicate that fog situations in the Greater Miami Area are associated with a wind flow with a westerly component, that is, from west to east, which would carry any heating effect from Card Sound out over the ocean and not over the land. At the Pollution Control Board Hearing on January 14, 1970 -- the fog that morning was cited as typical of how the warming of Card Sound would increase fog. During the previous 24 hours, the wind at all times had been from between west and north, and any Card Sound effect would have been carried away from land. It has been said by opponents of the canal "the higher the dew-point, the higher the amount of water vapor in the air, the sooner the fog will form, the more dense it will be and the longer it will last." Actually, as everyone well knows, the dew-points are highest in Florida in summer when we have no fog, and in the tropics where there is little or no fog.

It is my belief, based on 45 years of meteorological experience and our current knowledge of meteorological physics, that no significant adverse meteorological effects would result from the proposed FP&L canal.

There has been some discussion concerning the relative merits and practicability of cooling towers versus natural bodies of water. The Governor's Task Force on Nuclear Powerplants, Maryland, December 1969, composed of a formidable group of government and university scientists, educators and others, said:

"The evaporative loss (referring to a waste heat warmed area of Chesapeake Bay) would take place over a wide area, thereby avoiding the strong local disturbance of the atmosphere associated with artifical systems."

MR. STEEL: Mr. Chairman, our next witness will be Mr. Reisbol, and he has two documents.

HERBERT S. RIESBOL,
ENGINEERING MANAGER, HYDROLOGY,
BECHTEL INCORPORATED,
SAN FRANCISCO, CALIFORNIA

MR. REISBOL: Chairman Stein, distinguished guests, and ladies and gentlemen. My name is Herbert S. Reisbol. I am Chief Hydrologist and Engineering Manager of Hydrology and Hydraulics Group for Bechtel Incorporated, San Francisco, California.

I am a graduate of the University of Idaho with Bachelor of Science and professional degrees in civil engineering. Since graduation in 1929, I have had over 40 years experience in hydrology and hydraulic engineering. I am a registered professional civil engineer in the States of California, Colorado and Montana, a fellow of the American Society of Civil Engineers, and a member of the American Geophysical Union.

Herbert S. Riesbol

With Bechtel my responsibilities include cooling water studies relating to numerous large thermal-electric powerplants, both fossil and nuclear fired, in the United States and many foreign countries. These studies include the development of sources for water supply and the determination of thermal effects.

At the request of Florida Power & Light Company and Bechtel management, I have during the past 15 months reviewed the cooling water studies prepared by Bechtel Corporation and others for the Turkey Point power station. I visited the site in September 1968, and examined it in detail, keeping in mind the data, the studies and design alternatives that I had previously reviewed. Since then I have studied the additional data that have been collected, reviewed the new studies that have been carried out, and considered the additional design alternatives that have been explored.

In the following statement the many engineering methods analyzed for either disposing of the cooling water or dissipating the waste heat contained in that water are compared. On the basis of its careful engineering analyses of these alternative solutions, Bechtel Corporation recommends that the cooling water be withdrawn from Biscayne Bay at the plant, passed through the condensers, diluted with bay water at ambient temperature, conveyed through a 6-mile-long canal and discharged into Card Sound. This plan meets the Dade County Water Quality Standards, prevents recirculation of heated water, and can be built at reasonable cost.

Construction has been started on this plan and we believe it should be carried to completion as expeditiously as possible.

The total rate of flow of cooling water from Turkey Point Units 1, 2, 3 and 4 is 1,876,800 gallons per minute with a maximum temperature rise of 15.2°F through the condensers for such a volume. Average temperature rise would, of course, be somewhat less.

The purpose of cooling water studies and the development of design alternatives is two-fold:

1) To assure that the circulating water discharged into Biscayne Bay will not create thermal patterns in excess of the thermal criteria adopted by the Dade County Pollution Control authorities. Our understanding of the Dade County criteria is that,

after thorough mixing, the temperature of the receiving water shall not exceed 95°F.

2) To assure that the temperature of the circulating water entering the intake of the cooling water system will not be raised significantly above ambient bay temperature due to recirculation of warm water discharged form the system.

Bechtel engineers have considered every known engineering method of disposing of the circulating cooling water or of dissipating the excess heat from the water. The present designs of plant components, such as turbines and condensers, were based on the 15.2°F temperature rise. This basis has been maintained for each of these studies. This consideration of alternative methods has included development of feasibility design and cost estimates, evaluation of operational capabilities and limitations, and conclusions as to whether or not serious recirculation problems would occur, and the pollution control criteria would be met. Cost comparisons were made both on the basis of capital cost and annual costs. Capital cost includes construction costs, contingency, and engineering. Annual costs include fixed, operating, maintenance, and capacity costs.

Herbert S. Riesbol

The following methods were studied:

Ocean outfall to transport the warm water beyond Biscayne Bay into the Atlantic Ocean.

Dilution with Biscayne Bay water at ambient temperature to reduce the temperature of the cooling water from 103.2°F at condenser discharge to 93°F at point of discharge to the bay through the South Canal.

Cooling towers utilizing salt water from Biscayne Bay as circulating water were studied with open and closed cycle operation, with and without dilutant water, and with natural draft, forced draft, and induced draft towers. Open cycle operation was compared on the alternatives of returning the circulating water to the bay either at ambient temperature or at the then criteria limit of 93°F.

Cooling towers utilizing imported freshwater were also analyzed on about the same basis as the salt water towers.

Dry cooling towers were evaluated technically and economically.

Cooling ponds were compared on the basis of several conceptual designs. These included comparisons without removal of either the muck or the mangroves, with removal of mangroves only. And with full removal of the muck and mangroves down to the underlying limestone. The circulating cooling water was passed through ponds of several alternative surface areas. In some cases it received pond cooling only; in others it was mixed with diluting water before return to the bay. The circulating water was returned to the bay at either ambient or 93°F.

The final plan studied is the plan recommended for construction. Cooling water at ambient temperature would be pumped from Biscayne Bay at the plant and conveyed in a southerly direction through a 6-mile-long (30,000 feet) canal to Card Sound at the south end of Biscayne Bay. The circulating water would be diluted at the head of the canal by addition of an equal volume of Biscayne Bay water at ambient temperature.

The reports setting forth the details of the alternative plans have been submitted to the Dade County Pollution Control Department. I will not attempt to describe the details, the pros and cons, of each plan in this statement. However, I will quickly review some of the more important points that led to our recommendations of the Card Sound conveyance and dilution plan.

Herbert S. Riesbol

1. Dilution within the site area and discharge through South Canal -- this is the existing, former existing limits of the company site -- resulted in substantial recirculation to the intake.

2. Salt water cooling towers of large size have not been built and operated and consequently there are many unknown factors of design and operation.

3. Salt depositions from cooling towers may be detrimental to vegetation and equipment in the surrounding area.

4. Cooling towers require extra cost protection against salt water corrosion and hurricane winds.

5. Freshwater towers require expensive "seal off" of the existing salt water through flow system to prevent contamination by salt water. This would require a lengthy period of plant shutdown during the conversion. A large volume of fresh-makeup-water would be required and could be obtained only from large deep wells located 10 miles or more from the plant. Expensive pumping plants and pipelines would be required.

Makeup water for the cooling tower installation in the order of 52 million gallons per day, 58,000 acre feet per year will be required. This quantity of water will support an urban population of 280,000. Freshwater is a scarce resource and use of this large amount of freshwater is possibly contrary to the total interest of the community, and may hamper expansion in the area.

In support of that statement I present for the record this excerpt from The Miami Herald dated February 3, which sets forth the concern about water.

MR. STEIN: Without objection, this will be included in the record as if read.

(The above-mentioned article follows.)

Section B-1

The Miami Herald

Tuesday, February 3, 1970 Complete State News

'76 S. Florida Water Crisis Forecast

By DON BEDWELL
Herald Aviation Writer

South Florida, imperiled by pollution and excessive drainage, faces a virtually inescapable water crisis by 1976, a U.S. Department of the Interior official warned Monday.

Arthur Marshall said the Army Corps of Engineers estimated that only an expenditure of $160 million by 1976 could head off "a critical water shortage."

And, he told the South Florida area Planning Council, "it's almost impossible to expect that kind of appropriation at this time in history."

HE SAID that fish taken from South Florida waterways recently had shown dangerously high concentrations of DDT.

"Some of the hottest DDT concentrations ever measured have come from Everglades National Park," he said.

Marshall, a 15-year veteran of the U.S. Bureau of Sport Fisheries, voiced his warning as the tricounty council met with state legislators discussing the new training jetport.

Several officials agreed that the "bloodletting" over the controversial jet runway in the wilderness helped dramatize a growing crisis in the Everglades watershed.

"OUT OF the jetport controversy will arise a new awareness of our many environmental concerns," said John M. Kurke, a Collier County commissioner.

"We are tied together by a common bond — concern over the natural resources of Everglades National Park and its watershed."

Biologists emphasized that those concerns were both real and immediate.

Metro Commissioner Alex Gordon urged that the tricounty unit — with membership from Dade, Collier and Monroe counties — be extended to include representatives from all counties south of Lake Okeechobee.

"The council is not just a fine thing but an absolutely necessary thing as our population grows," Marshall said.

HE SAID that the threat to wildlife was endangering such Florida industries as commercial fishing as well as the park.

Most of the problems, he said, can be attributed to sprawling urbanization and farming of land in the Everglades watershed and to the restriction of the natural water flow by artificial canals and barriers. Measurable symptoms include a rising incidence of pesticides in marine life, the intrusion of salt into freshwater areas, erosion of rich mucklands and the decimation of species of wildlife.

"The red warning flag has been posted," said Reginald Walters, director of the Dade County Planning Department.

He said that the planning council is seeking $50,000 in federal and local funds to hire a full-time coordinator and supporting staff.

ANOTHER $1.5 million is being sought for a detailed study of the watershed by experts in hydrology and other specialties.

One study already under way in the Big Cypress Swamp portion of the Everglades was outlined by Thomas J. Buchanan of the U.S. Geological Survey.

That study is to be presented to Interior Secretary Walter Hickel by June 1 under a $60,000 federal grant, possibly only the first increment in a three-year study of the Everglades.

Herbert S. Riesbol

MR. REISBOL: (Continuing)

6. Dry cooling towers which cool by heat transfer through finned tube surfaces were investigated and found to be extremely costly, second only to the ocean outfall. Since there has been no experience with large installations, considerable research would be required to overcome the many technological problems.

7. At the request of the Dade County Pollution Control Hearing Board, Bechtel made a thorough study of the ocean outfall alternative. It is concluded that the ocean outfall scheme will cost at least $101,000,000 and also, this alternative contains builtin hazards due to hurricanes, salt water corrosion, bottom instability and possibly other factors. Construction would require extensive dredging in Islandia National Monument.

In support of this statement, I submit a study that we made.

MR. STEIN: This will be included without objection.

(The above-mentioned study follows.)

Bechtel Corporation

Post Office Box 607
190 Shady Grove Road
Gaithersburg, Maryland 20760

November 3, 1969

Mr. W. H. Rogers, Jr.
Manager Power Plant Engineering
Florida Power & Light Company
Post Office Box 3100
Miami, Florida 33101

Subject: Florida Power & Light Company
Turkey Point Units 1, 2, 3 and 4
Bechtel Job 5177
Cooling Water Study

Dear Mr. Rogers:

Herewith are copies of our report entitled "Turkey Point Units 1, 2, 3 and 4, Ocean Outfall and Pumping Plant", dated November 3, 1969. The report has been prepared in accordance with request contained in your Mr. R. J. Gardner's letter of October 9, 1969 to our Mr. J. H. Utegaard.

The report is based on studies carried out by Bechtel's Pipeline Division (Marine Engineering Section) at San Francisco, and Power and Industrial Division at Gaithersburg. The cost basis is consistent with Bechtel's Study Report of July, 1968.

It will be noted that both steel and concrete pipelines were priced. The proposed routing would extend from the vicinity of Lake Warren on the Turkey Point property, across Biscayne Bay and Elliott Key to a point in the ocean at about 50-foot depth, for a total distance of about 65,000 feet from the plant property line. We believe that the system could be designed and constructed in 30 months. Total capital costs would be as follows:

Total Capitalized Costs - 65,000 Feet

Steel Pipe	$ 119,000,000
Concrete Pipe	$ 101,000,000

Please note that the proposed pipeline would terminate between Pacific Reef and Ajax Reef about 5000 feet short of the 70,000 feet from the plant property specified in Mr. Gardner's letter. Should it be necessary to extend the

the pipeline to 70,000 feet, the following tabulation records the resulting total capital costs:

Total Capitalized Costs - 70,000 Feet

Steel Pipe	$ 126,500,000
Concrete Pipe	$ 108,000,000

This study has not disclosed any reason to alter our previous recommendation to proceed with a combination of dilution and discharge to Card Sound.

We appreciate this opportunity to again be of service in connection with the Turkey Point project. Please advise if additional information is required.

Very truly yours,

S. Crocker

S. Crocker
Project Engineer

SC:rp
Attach.

cc: Dr. James Coughlin/Mr. R. J. Gardner

FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNITS 1, 2, 3, and 4

OCEAN OUTFALL AND PUMPING PLANT

November 3, 1969
Gaithersburg, Maryland

Bechtel Corporation
Job 5177-19

FLORIDA POWER AND LIGHT COMPANY
TURKEY POINT UNITS 1, 2, 3, and 4
OCEAN OUTFALL AND PUMPING PLANT

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A. INTRODUCTION

This report on a direct outfall to the ocean for Turkey Point Station cooling water has been prepared for the Florida Power and Light Company in accordance with Mr. R. J. Gardner's letter of October 9, 1969 to Mr. John H. Utegaard.

The capital costs for the entire system are shown in Table I of Section G herein. Annual costs are shown in Table II of Section G herein for the entire system.

B. Summary

This report presents a conceptual design study of the direct outfall to the ocean for the warm water effluent from Turkey Point Units 1, 2, 3, and 4. The design criteria are consistent with the requirements stated in Mr. R. J. Gardner's letter of October 9, 1969 to Mr. J. H. Utegaard except as noted below under Items 2 and 3. The following items of design follow the same numbered sequence as those in Mr. Gardner's letter:

1. The outfall will provide for a discharge of 4250 cubic feet per second with a maximum temperature of 105 degrees and a minimum temperature of 65 degrees.

2. The outfall will extend beyond the reefs offshore at Elliott Key at a distance of approximately 65,000 feet from the Turkey Point property, rather than the 70,000 feet stated in the letter. The line would terminate in a depth of about 50 feet which is deemed satisfactory on the basis of present knowledge of offshore conditions.

3. This study does not include the requested canal to transport the circulating water to the eastern edge of the Turkey Point property on the western shore of Biscayne Bay. Instead, the study is based on locating the pumping station approximately 700 feet from the shore terminus as shown on drawing C-16 and discussed under "System Design" herein.

About 700 feet of pipeline would be required instead of a canal.

4. This study includes a structure and pumps, as shown on the sketches herein, sufficient to transport the circulating water through the pipeline.

5. The pipeline will be buried throughout its length.

6. Consideration has been given to construction matters such as width and depth of trench, backfill and area affected by spoil and silt disposition. Excess spoil material will be removed from the bay bottom.

7. Consideration has been given to maintenance and inspection. In the design of the pumping station we have provided one spare pump to insure continuity of service when a pump is shut down for maintenance. Three, half-capacity pumps would be provided. Suitable valving is provided for this maintenance and pressure type manholes would be provided at intervals in the pipeline for inspection purposes. Two, half-capacity pipelines are provided, based on previous discussions and consistent with the Bechtel study report of July 1968.

8. The economic evaluation includes both the loss of generating capacity due to the power requirements of the pumps as well as the operating

and maintenance cost of the pumps.

9. This report, as requested, does not include provisions for obtaining the necessary permits.

10. Schedule requirements have been investigated to cover the delivery of the pumps and construction time required for the pumping station and outfall line.

C. SYSTEM DESIGN

1. PUMPING STATION

The pumping station would be built to handle a total capacity of 4250 cubic feet per second against a total dynamic head of about 115 feet. Three half-capacity pumps would be provided so that one spare would be available. All equipment would be designed for outdoor operation. The pumps would be connected to a transition chamber so that they could be operated singly or in pairs, and so one pipeline could be shut off for maintenance.

The pumps would be of the vertical, volute, dry pit design with elbow type suctions and constructed, where required, of stainless steel to withstand the corrosive action of sea water. The proposed pumps make use of an existing design and production facility. They are, basically, modified 2,000 cfs water turbines.

Mixed flow type pumps were investigated, however, due to the poor NPSH characteristics, this design would require a deeper excavation for the pump setting and a more expensive structure. The mixed flow type pump would be less efficient requiring larger motors with resultant higher pumping costs.

Wet pit type pumps were studied, however, due to the requirement of internal submerged bearings, they were not considered as reliable.

The location of the pumping station would be about 700 feet from the shore terminus (at Lake Warren) and would discharge by pipe into the outfall. This location was chosen after consideration of the following significant factors:

a. The pump power requirement would place a significant demand on the 240 KV electrical system, both in starting and carrying load. An important factor in carrying the design forward would be the effect of the transmission line characteristics on the system. Although system stability studies would be required as part of any future design effort, it can be said at this stage that the lines ought to be as short as practicable. The location of the pumps at Lake Warren, relatively close to the switchyard, is therefore, preferable to a more shoreward location.

b. The location of the pumping station at Lake Warren places it closer to normally-manned plant areas, thus simplifying routine attention by the plant personnel.

c. The location of the pumping station at Lake Warren is farther from a potential source of salt spray, which is desirable for better protection of the outdoor equipment.

2. ROUTE DESCRIPTION

Alignment

The alignment and overall length of the outfall have been developed from U. S. Coast and Geodetic Survey Charts. In the complete absence of detailed information on localized currents and tidal movements, the line has been terminated east of Ajax and Pacific reefs in approximately 50 feet of water. Total line length is 65,000 feet.

In view of the limited data available no attempt has been made to refine the alignment to minimize ecological damage or first cost. However, realignment in the same general location by introduction of long radius curves would not invalidate either the general conclusions or cost estimate.

Profile

A minimum of 3 foot cover has been provided over the entire line. In the event that increased cover is required at the Intra-coastal Waterway, a localized grade adjustment is possible. An air relief valve at Elliot Key permits a grade reversal and improved access at that point.

Geology

No borings have been made for this outfall. The limited information upon which the cost estimate is based has been derived primarily from borings made for Corps of Engineer studies for dredging of the Intra-coastal Waterway in Biscayne Bay, the nearest of which was approximately three miles north of the proposed alignment. These borings consistently indicate hard limestone with little or no overburden. Soils investigations conducted at Turkey Point reveal essentially similar conditions except for an increase in overburden.

3. PIPE SELECTION

Line Losses

Pressure drop in the line was estimated for the maximum design flow of 4250 cfs, using Manning's formula with the following "n" factors:

precast concrete pipe:	0.012
coated welded steel pipe:	0.012
corrugated metal pipe:	0.027

Total head loss for 15'-0"I.D. concrete and welded steel pipe was computed as 115 ft. or 50 psi. For corrugated metal pipe a 19'-6" diameter would be required to maintain equivalent head loss.

Concrete Pipe

Calculated internal pressures in the pipe were arbitrarily increased by 25% for pipe design. This was done to provide some margin for overload during a period when one pipe is out of service for inspection. It is anticipated that up to 50% of the total length would be "cylinder" pipe. Sections approximately 24 ft. in length would be provided with flush type bell and spigot couplings using a seal ring and epoxy grout. Except for joint modifications the pipe would be of conventional type; possibly wall thickness would be less than the normal industry standard of 13-1/4".

Welded Steel Pipe

Welded steel pipe would be fabricated of class X42 plate, with all welds blended smooth into the base metal. High quality internal and external protective coatings would be specified. External cathodic protection would be of the impressed current type; interior cathodic protection would be provided by sacrificial anodes at approximately 20 ft. centers. It is anticipated that the D.C. current requirement would not exceed 150 amps at 20 v.

Wall thickness requirements have been selected by the conservative analysis applicable to submarine pipelines with poorly controlled and uncompacted backfill. (reference 2). Accordingly, bending due to backfill placement has been the dominant factor in setting wall thickness. A wall thickness of 1" is proposed.

Corrugated Metal Pipe

The difficulty of providing satisfactory cathodic protection and insuring the longevity of the lines were considered too great for corrugated metal pipe to be an acceptable material.

Other Discarded Alternates

The use of large precast-reinforced concrete segments was rejected because the weight is excessive for handling and placement. Polyethylene and fiberflas products were considered, but the technology for production of the required size is not sufficiently advanced.

Maintenance

Concealed access manholes can be provided at regular intervals.

4. CONSTRUCTION METHODS

Excavation and Backfill

It is anticipated that the limestone dredging and backfill of the pipe trench would be accomplished by cutter suction dredges. By using the larger and heavier dredges, blasting can be minimized. Excess material not required for backfill within Biscayne Bay would be wasted on land at Turkey Point, while waste material from the seaward side of Elliott Key would be dumped at sea by hopper barges. Gravel pipe bedding would be placed by pumping from hopper barges.

Concrete Pipe

A special plant would be erected at Turkey Point for the manufacture of precast concrete pipe in 24 ft. lengths. It is proposed to assemble pipe on shore in strings of about 20 sections. The pipe string would be held in controlled compression by a center tensioning cable, and launched in strings using a lateral launching ramp. During the towing process, the pipe string buoyancy will be maintained.

The depth of water required to float the concrete pipe is such that it would be necessary to use the open pipe trench to float the strings and to commence laying operations at the outer end. At the contractor's option, the trench might be over-excavated, permitting an alternate pipelaying sequence.

Steel Pipe

Steel pipe would be delivered by barge to Turkey Point, in 40 ft. lengths. It would be welded on shore into lengths of not less than 480 ft. and given a protective coating before launching. Sacrificial anodes would be attached on shore.

D. CONCLUSIONS AND RECOMMENDATION

At this time only two readily available pipeline materials satisfy all the requirements for capacity, longevity and minimun maintenance in the Biscayne Bay water. These are reinforced concrete pipe and welded steel pipe suitably coated and provided with cathodic protection.

On the basis of first cost and maintenance cost, dual 15'-0" internal diameter reinforced concrete pipes would be preferred over steel for the installation of the ocean outfall.

A three unit pumping station and transition chamber as previously described would be preferred unless electrical system studies (which would be required in any further design development) dicated that more, smaller, motors be used.

Due to the high capital cost and operating cost of this concept, it is our recommendation that study of the direct outfall system be abandoned. It should be noted that the recommendation of the Bechtel Study Report of July 1968, as modified by subsequent discussions, should be adopted. The recommended way to discharge the plant cooling water remains a combination of dilution with unheated water and discharge of the combined streams to Card Sound. This recommendation has been made a matter of public record as noted in Section J, herein (Reference C).

It is considered that the recommended scheme would require about half the time in construction and would result in minimum effect on the Biscayne Bay bottom, as compared to the direct ocean outfall.

E. SCHEDULE

It is estimated that the design, procurement and construction of the entire direct outfall system would require not less than 30 months from release to proceed with detailed engineering effort.

F. CONSTRUCTION METHODS

The construction methods for the offshore portion of the ocean outfall as as described on Pages C-6 and C-7.

The construction methods contemplated for the pump structure at this stage of design would be similar to those used for the construction of the intake structure for Turkey Point Units 3 and 4. That is, the lower section would be constructed in a dewatered excavation and floated into place. The upper section would be constructed in place.

G. COST ESTIMATES

GENERAL

All costs used in this study are order-of-magnitude estimates developed by Bechtel Cost Engineering. Costs do not include property acquisitions, infringments of right-of-ways, relocation or disruption of experimental, training, or recreational facilities, possible saline contamination or Florida Power & Light Company's engineering management and other costs.

Pricing is based on present day costs as of October 1969. Material cost estimates were based on preliminary information provided by manufacturers, current catalogues, and purchase order costs for similar equipment, where possible.

Costs

The capital costs are given in Table I. The annual costs are given in Table II. Both tables are totals for the offshore and onshore facilities.

Operating costs are based on continuous use of the system at full load. Fixed charges are 15% per year. Energy cost is six mills per kw-hr. Maintenance costs are 0.5% of capital cost of the offshore portion, and 0.2% for the onshore portion, per year. Except for the maintenance cost of the pipeline, all of these costs are treated as in the Bechtel July 1968 Study Report.

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FLORIDA POWER & LIGHT CO.

TABLE I

OCEAN OUTFALL - CAPITAL COSTS

(All Costs in $1,000's)

TOTAL ONSHORE AND OFFSHORE WORK

Description	Steel Pipe	Concrete Pipe
Pumps and Drives	$ 4,980	$ 4,980
Other Mechanical Equipment	130	130
Electrical	390	390
Switchyard	170	170
Pump Structures	850	850
Circulating Water Pipe	62,730	42,730
Dredging and Earthwork	13,030	14,530
Distributables	5,660	7,160
Contingency	4,400	4,400
Engineering and Home Office	1,810	1,810
Fee	2,850	2,350
TOTAL PROJECT COSTS	$97,000	$79,500

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FLORIDA POWER & LIGHT CO.

TABLE II

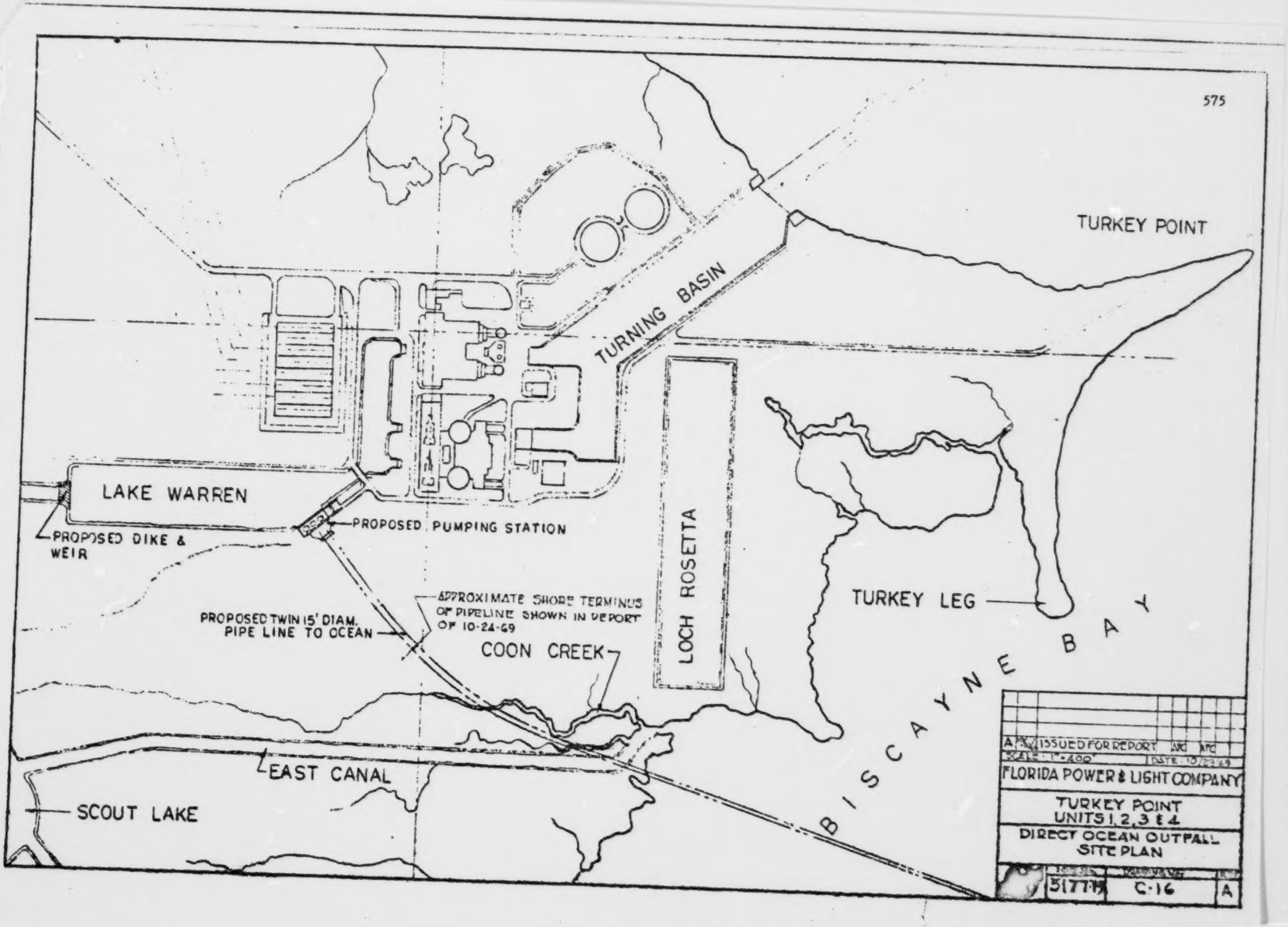
OCEAN OUTFALL - ANNUAL COSTS
(All Costs in $1,000's)

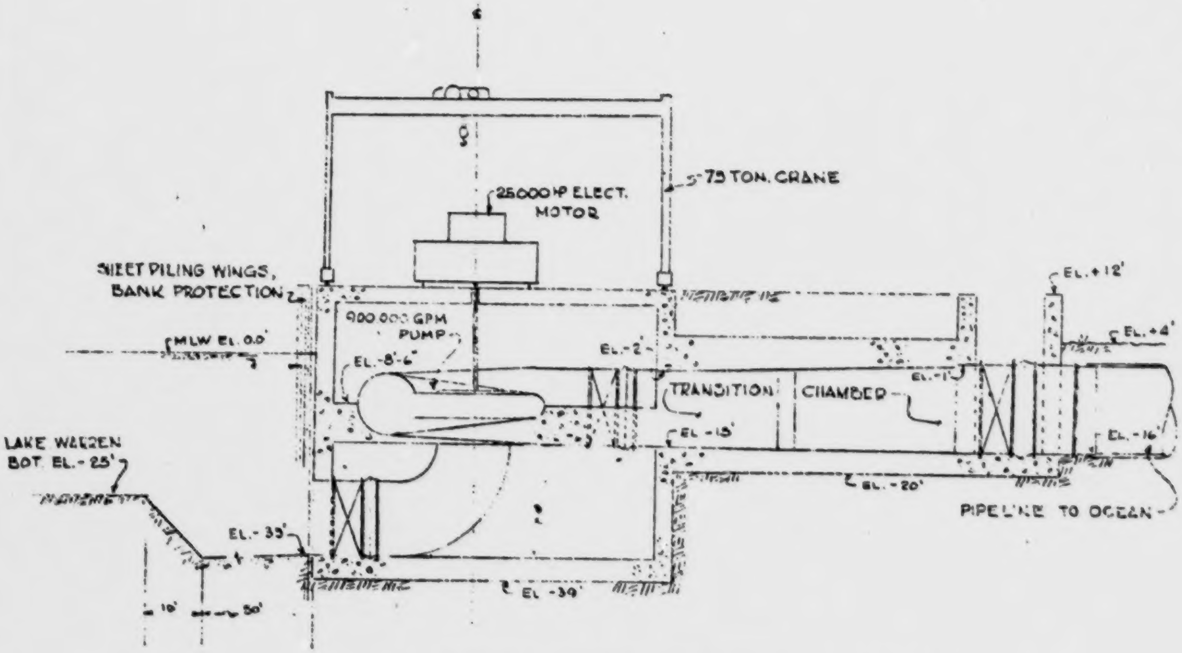
TOTAL ONSHORE AND OFFSHORE FACILITIES

	Steel Pipe	Concrete Pipe
Summary of Direct Capital Cost	$97,000	$79,500
Annual Cost		
Fixed Charges	14,550	11,925
Operating Cost	2,200	2,200
Maintenance Cost	458	371
Capacity Cost	625	625
TOTAL	$17,833	$15,121
Total Capital Cost (Including capitalized operating, maintenance and capacity cost)	$119,000,000	$101,000,000

H. DRAWINGS

1. Direct Ocean Outfall Site Plan (C-16)
2. Direct Ocean Outfall Pump Structure (C-17)
3. Direct Ocean Outfall Routing, Cross-Section & Profile (CSF-1)


TURKEY POINT
TURNING BASIN
LAKE WARREN
PROPOSED DIKE & WEIR
PROPOSED PUMPING STATION
LOCH ROSETTA
TURKEY LEG
APPROXIMATE SHORE TERMINUS OF PIPELINE SHOWN IN REPORT OF 10-24-69
PROPOSED TWIN 15' DIAM. PIPE LINE TO OCEAN
COON CREEK
BISCAYNE BAY
EAST CANAL
SCOUT LAKE
A
ISSUED FOR REPORT
SCALE: 1"=400'
DATE: 10/23/69
FLORIDA POWER & LIGHT COMPANY
TURKEY POINT
UNITS 1, 2, 3 & 4
DIRECT OCEAN OUTFALL
SITE PLAN
5177-15
C-16
A



25000 HP ELECT. MOTOR
75 TON. CRANE
SHEET PILING WINGS, BANK PROTECTION
900,000 GPM PUMP
MLW EL. 0.0'
EL. -8'-6"
EL. -2'
TRANSITION
CHAMBER
EL. -1'
EL. +12'
EL. +4'
EL. -15'
EL. -16'
EL. -20'
PIPELINE TO OCEAN
LAKE WARREN BOT. EL. -25'
EL. -35'
EL. -39'
10'
50'

TYPICAL SECTION THRU PUMPING STATION

SCALE: 1" = 20'

A	¾	ISSUED FOR REPORT		WT	WC		

SCALE: AS SHOWN DATE 10-30-69

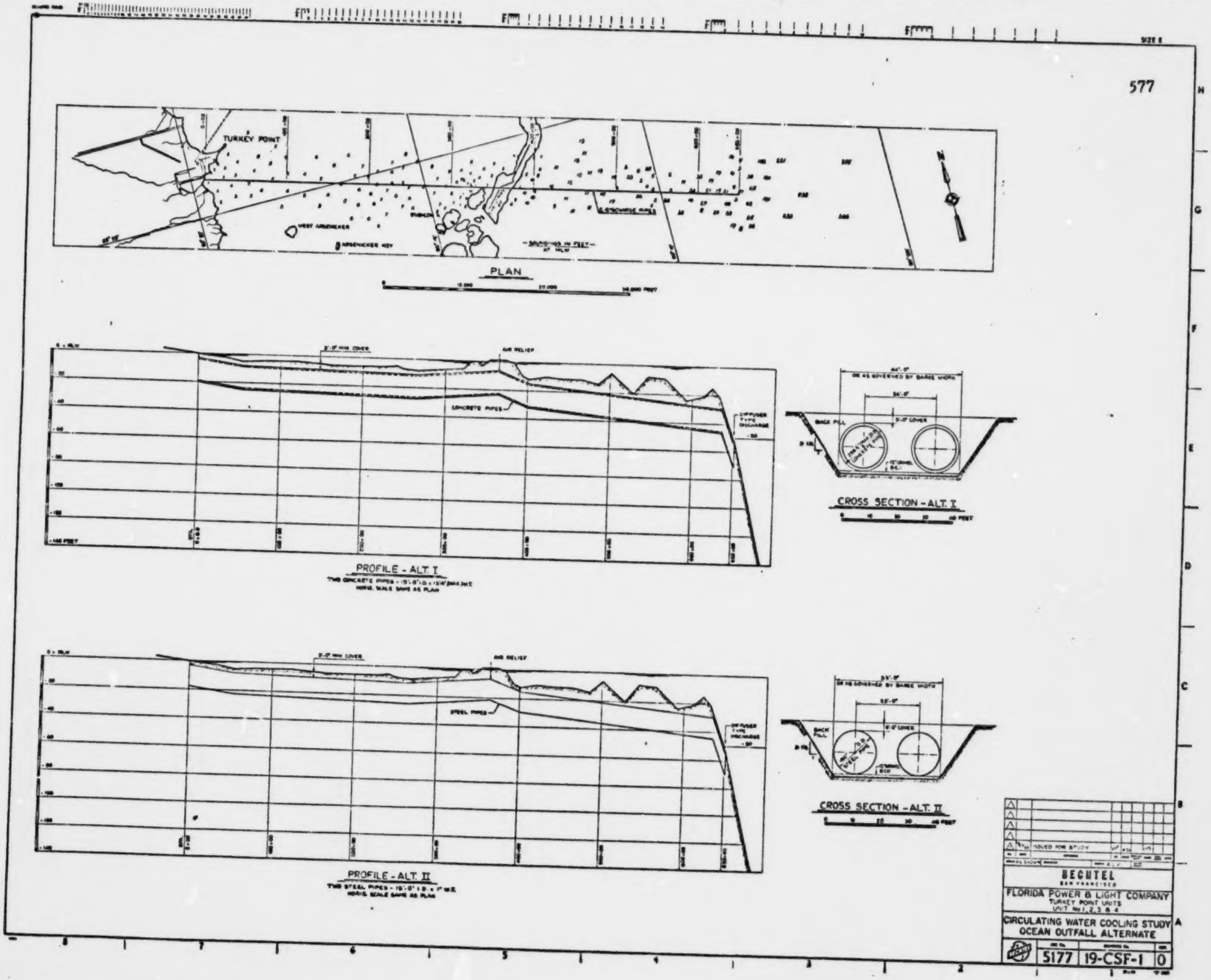
FLORIDA POWER & LIGHT COMPANY

TURKEY POINT
UNITS 1, 2, 3 & 4

DIRECT OCEAN OUTFALL
PUMP STRUCTURE

JOB No.	DRAWING No.	REV.
5177-19	C-17	A

577


TURKEY POINT
WEST ARSENICKER
ARSENICKER KEY
SOUNDINGS IN FEET AT MLW
DISCHARGE PIPES
0
10,000
20,000
30,000 FEET
3'-0" MIN COVER
AIR RELIEF
CONCRETE PIPES
DIFFUSER TYPE DISCHARGE
STEEL PIPES
-140 FEET
BACK FILL
3'-0" COVER
0
10
20
30
40 FEET

PLAN

PROFILE - ALT. I

TWO CONCRETE PIPES - 15'-0" I.D. x 15'-8" [illegible]
HORIZ. SCALE SAME AS PLAN

CROSS SECTION - ALT. I

PROFILE - ALT. II

TWO STEEL PIPES - 15'-0" I.D. x 1" W.T.
HORIZ. SCALE SAME AS PLAN

CROSS SECTION - ALT. II

ISSUED FOR STUDY

BECHTEL
SAN FRANCISCO

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT UNITS
UNIT No 1, 2, 3 & 4

CIRCULATING WATER COOLING STUDY
OCEAN OUTFALL ALTERNATE

5177 | 19-CSF-1 | 0

J. REFERENCES

The following reference material has been utilized or consulted in the preparation of this report:

A. Bechtel report "Circulating Water Cooling Study for Turkey Point Power Plant" dated July 1968.

B. Private communication from Baldwin-Lima-Hamilton Corporation to Bechtel, dated October 22, 1969, BLH Reference 52585-550, Subject: FP&L, Turkey Point Plant.

C. Testimony before the Dade County Pollution Control Commission, by H. S. Reisbol, Bechtel Corporation, on September 18, 1969.

D. U. S. Corps of Engineers, Jacksonville, Fla., Intracoastal Waterway - Examination Survey, April 1968. (Soil Borings)

E. Bechtel Corporation, Analytical Methods for Structural Analysis of Pipeline Crossings, March 1967.

F. American Water Works Association, Steel Pipe Manual M11 1964.

G. American Iron and Steel Institute, Handbook of Steel Drainage and Highway Construction Products, 1967.

H. Timoshenko, S., Theory of Elastic Stability, McGraw Hill, 1936.

Herbert S. Riesbol

MR. REISBOL: (Continuing)

8. Cooling ponds have several major disadvantages:

a. The problem of saline intrusion and its effects on surrounding property and underlying water tables.

b. Possible adverse effects on the local ecological balance by removing or inundating large acreages of mangroves and muck.

c. Unknown factors of cooling pond performance if the mangroves and muck are left in place.

The conveyance and dilution canal to Card Sound avoids the problems described above. There would be no recirculation to the plant intake. The cost is lower than any other scheme. Dade County requirements would be met.

The Card Sound canal is recommended for construction as the best method for cooling water disposal from Turkey Point plant.

MR. STEIN: Thank you, Mr. Reisbol, for a very excellent report. I think that it sets forth the position very clearly.

Are there any comments or questions?

MR. REED: Yes. Mr. Reisbol, recognizing that your compnay was working with the Dade County 95° standard, would your company wish to reevaluate its recommendations if the conferees bring back in a lower temperature requirement as a new standard?

MR. REISBOL: If our client, the Florida Power & Light Company, so requested it, we, of course, would be willing to do it.

MR. REED: That is not what I said. Besides what the company would request, your figures are -- your recommendations are based at returning the water at not higher than 95°. Is that right?

MR. REISBOL: Our studies were based on the -- first, it was 93°, and later 95°, based on the change in criteria that we were given at that time. Our studies are based on the criteria that were given us.

MR. REED: Of 95°?

MR. REISBOL: I beg your pardon?

MR. REED: Of 95°?

MR. REISBOL: Yes, of those temperatures.

MR. REED: What I am trying to get at, if 93°, 92° or something else was brought in, it might be necessary to seriously reevaluate your recommendations as to what formula you would employ, or it might be that you would define the cooling in this type of a system that you have promulgated. Am I being clear?

MR. REISBOL: Yes, as far as I can see, any system that we design that we have submitted here, we design it to fit any set of criteria that we are given.

MR. REED: I know that the Bechtel Corporation is probably the biggest engineering firm in the world. Just for my limited experience, have you ever seen a problem similar to this, from an engineering standpoint?

MR. REISBOL: Well, I'd have to go back in my mind and review a great many.

MR. REED: This is a difficult one, isn't it?

MR. REISBOL: It is a difficult one, yes, but we worked on many different ones.

MR. REED: But this is one that I wish you would give me the particular benefit of the doubt. It is a particularly difficult one?

MR. REISBOL: It is a difficult one.

MR. REED: That is all I have.

MR. THOMAN: I have just a couple of questions. Your initial report for Florida Power & Light Company is dated July 1968. Some of these alternatives were reviewed at that time you were working with a design criteria of 93°, I believe, and you so indicated in your report. Is there a later version of this report?

MR. REISBOL: I have here a report dated January 1970, which incorporates without change the studies that were made and presented in July of 1968, and in addition it incorporates the ocean outfall study and the Card Sound study.

MR. THOMAN: In other words, you have incorporated the 1968 studies, including the cost estimates, without further review?

MR. REISBOL: That's correct.

MR. THOMAN: Thank you very much.

MR. STEIN: Any other questions?

Mr. Reisbol, from the heading on your paper, or your letterhead, it looks as if you are a neighbor of mine. Shady Grove Road, Gaithersburg, Maryland.

I think that you made an excellent summary, but I'd like to go to the three points you made. Obviously, in your analyses, one of the points was that the Dade County requirements would be met.

Now, the issue we have is that we may not just have Dade County requirements when we are through. You may have Federal and State requirements as well. Now, as I read the Dade County requirements that you met, they were largely temperature requirements, but there may be a flow requirement in putting water into a bay.

Now, given those assumptions, could you presumably design a system to meet those specifications?

MR. REISBOL: Yes, sir, if we are given a criteria, and our client so desires, we can redesign or design a system to meet any given set of criteria.

MR. STEIN: When you say the cost is lower than any other scheme -- and I know all the engineers do that -- sometimes you have to get a higher cost to get some social value. But the next point you make and I quote, "There would be no recirculation to the plant intake." In other words, it is conceivable that you could have put this water into Biscayne Bay if you didn't have circulation problems -- recirculation problems?

MR. REISBOL: Recirculation is certainly a critical point and affects the efficiency of the plant.

MR. STEIN: Again, here is the situation that we have to face -- a circulation pattern. You have a powerplant that is going on line. You have a recirculation problem due to the wastewater coming out of the plant, which is affecting the plant operation or the plant intake.

The plant is creating that, and the proposed solution to that is to discharge that into another body of water. I can appreciate your solution to the problem, but I submit that this is going to be a very difficult concept with which the conferees are going to have to grapple.

MR. REISBOL: I think we should point out that the location of the discharge point in Card Sound was based not only upon the recirculation problem but upon the effects, other effects.

MR. STEIN: That is right. But, again, I'm just reading your summary here. You say, "The conveyance and dilution canal to Card Sound avoids the problems described above. There would be no recirculation to the plant intake."

That is your first point. I agree with that. The question that the conferees have to face is if this kind of consideration is a valid consideration for pollution control. It would be very simple if every discharger would run a pipe to another watershed, and another body of water and get rid of the waste. That is a wonderful way to do business.

I know, for example, one thing. When they polluted the Potomac back home, one of the proposals was to construct a pipeline and discharge the waste into Chesapeake Bay somewhere near Annapolis. This would have solved our problem. There was only one problem -- the people around Annapolis didn't think it was such a good idea, and so it was abandoned.

The problem that we always have -- and I put this out because this is a real tough State-Federal problem. If we are going to permit the discharge of waters to another body of water, and I will assume for the purpose here that Card Sound is a body of water because they have this check valve, and our experts in the field tell me that the bottom is different; that the circulation pattern and ecology is different. We always have the problem of taking waste from one area and discharging it to another body of water. I think we run into some very severe social and economical problems.

MR. PATTON: I have a question. Who designed the original canal cooling system?

MR. REISBOL: The original design of the cooling system was set forth in July of 1968 in a report, and was prepared by Bechtel Corporation.

MR. PATTON: And they did not anticipate the recirculation problem that developed?

MR. REISBOL: The recirculation problem appears to be more serious than we had thought.

MR. REED: Did Bechtel ever discuss another route of the canal going north, if the flow pattern is to the north? Would you consider going to the north, or did you?

MR. REISBOL: We did consider it at one time going to the north.

MR. REED: Did that not prove feasible?

MR. REISBOL: It did not seem to be desirable because of the variation in the flow pattern that takes place. I am not speaking of the flow in the bay. The flow in the bay isn't always to the north, and isn't always to the south. I think that Dr. Pritchard, of Johns Hopkins University, made an extensive study of the flow pattern in the bay, and he showed that for a large percentage of time it was moving north, and for another large percentage of the time it was moving south.

MR. STEIN: Before the company finishes -- or maybe you don't want to comment on this, but it seems that we are faced, I think with this problem. Originally, as I look at the record, you didn't intend to go to Card Sound. You intended to discharge waste in Biscayne Bay. Somehow the calculations that this was determined on didn't work, and then it was decided to build a canal to Card Sound.

Now, on the basis of the information that we have had adduced here, how can we be assured that the same miscalculations that apparently happened in Biscayne Bay won't happen in Card Sound; and shouldn't we approach this kind of carefully if we are going to do this since we had to switch from the original proposal of the discharge into Biscayne Bay?

Now you are picking Card Sound. Do we have any better information than we had in the first place? Or are we just going to run this into another body of water and have another problem?

MR. REISBOL: There is another gentleman coming on that I believe can answer this.

MR. STEIN: The reason I raise this question here is that I didn't want to save it until you were all through, because I think this is a question the company wants to address themselves to.

Thank you. Are there any other questions or comments? If not, thank you.

MR. STEEL: Mr. Chairman, our next witness is Mr. Lyerly, and he has one document.

RAY L. LYERLY, SENIOR ASSOCIATE,
SOUTHERN NUCLEAR ENGINEERING, INC.
DUNEDIN, FLORIDA

MR. LYERLY: Mr. Chairman, my name is Ray L. Lyerly, and my business address is Post Office Box 10, Dunedin, Florida. I am a Senior Associate in the design and consulting firm Southern Nuclear Engineering, Inc.

I have a Bachelor's Degree in Mechanical Engineering from North Carolina State University, and a Master's Degree in Mechanical Engineering from Columbia University. I have had 22 years of experience in the fields of heat transfer and nuclear engineering. I am a registered professional engineer in the State of Florida.

Southern Nuclear Engineering is a broad based firm serving the utility and nuclear industry. Its staff includes professional skills of all engineering disciplines appropriate to this industry.

Ray L. Lyerly

At the request of Florida Power & Light Company, Nuclear Engineering performed a study of the feasibility of using cooling towers to reduce the temperature of heated salt water. The study centered about the technical factors involved in the possible use of towers to cool the discharge water from the condensers of the power generating units at Turkey Point. We were instructed to include as part of this study a comprehensive review of salt water cooling tower experience.

Over 800 man hours of senior engineering manpower were devoted to the investigation. The work was performed under my direct supervision.

I hereby would like to place into the record of this conference our report entitled "An Evaluation of the Feasibility of Salt Water Cooling Towers for Turkey Point" dated February 1970, Report Number SNE-54.

MR. THOMAN: We will accept this, Mr. Lyerly, as an exhibit. It will not be incorporated as part of the record, but will be in the files of the Federal Water Pollution Control Administration, and the Southeast Regional Office, Atlanta, Georgia. It is available during normal business, 8 - 4:30.

(The above-mentioned report, marked Exhibit No. 3 is on file at Headquarters, FWPCA, Washington, D. C. and the Southeast Regional Office, Atlanta, Georgia.)

MR. LYERLY: The following is a summary of this report:

Cooling towers have been widely used for many years in a variety of commercial and industrial applications. Notable among the applications is the use of freshwater towers to cool the condenser water of power plants. Although cooling towers are in service at power stations throughout the world, few use salt water since freshwater is generally available. An adequate supply of freshwater is not available at Turkey Point for cooling tower service.

The consideration of cooling towers for Turkey Point and the study that Florida Power & Light has sponsored were the result of a desire to consider all practical methods available to minimize the temperature of the water discharged to Biscayne Bay. The evaluation of cooling towers for Turkey Point was based on the concept in which the towers are located downstream from the condensers and cool the water before it is returned to the bay.

The study involved an assessment of the state of the technology of salt-water cooling towers, and domestic as well as foreign sources were used in compiling the information necessary to evaluate the feasibility of towers for the specific application. The methods of obtaining information included the following:

1. Review of the literature in several libraries including the Cooling Tower Institute.

2. Personal visits to the offices and facilities of the Fluor Products Company, Inc., Santa Rosa, California, The Marley Company, Kansas City, Missouri, and Hamon Cooling Tower Division of Research-Cottreel, Inc., Bound Brook, New Jersey.

3. Personal visits to the FWPCA headquarters office in Arlington, Virginia, and the Pacific Northwest Water Laboratory of the FWPCA, Corvallis, Oregon.

4. Numerous overseas calls to designers, constructors, and utilities in England, France and Germany.

5. Personal visits to inspect at first hand the two salt water cooling towers in current operation in this country, one at the Chevron Oil Company, Perth Amboy, New Jersey, and one at the Enjay Chemical Company, Linden, New Jersey.

6. A personal visit to the engineering offices of a major oil company that is planning the construction of a saltwater cooling tower.

7. Numerous telephone calls to industries and utilities operating fresh water cooling towers.

8. Numerous telephone calls to knowledgeable engineers with long term experience in the cooling tower industry.

Based on the results of our survey, we believe that a salt water cooling tower system of the magnitude required for Turkey Point could have consequences on the environment that would be totally unacceptable. The outstanding unresolved issue is drift. Simply defined, drift refers to the water carried up the stack in fine droplets and released to the atmosphere.

In salt water cooling towers these droplets contain salt. The problems are: 1) how much salt comes out of the cooling towers, 2) what is the size of the area over which this salt is deposited, and 3) what effect does the salt have upon the surrounding environment, including plant and animal life, and soil and structures of the area.

Using a typical cooling tower drift of 0.1 percent of the cooling water flow rate, our calculations indicate that 33,000 pounds of salt will be dispersed into the air each hour. This amounts to about 400 tons each day. Assuming that this disperses across the countryside in accordance with observed behavior of other industrial dust particles, at a one mile distance from the towers each square foot of ground will receive a fallout of 3 pounds per year, which is 66 tons per acre per year. Similar numbers to these were quoted in a recent report entitled "Governor's Task Force on Nuclear Powerplants, Nuclear Power in Maryland, December 1969." We fully agree with this document which says that salt water "cooling towers appear to be unacceptable."

Prior to building a salt water cooling tower system as large as that required for Turkey Point, substantial research, development, and prototype testing will be required. There is no such work being carried out at this time, or even contemplated. It is judged that a program to do this job would require a minimum of 4 years and several million dollars.

Thank you.

MR. STEIN: You can handle this any way you wish, but we have an expert here on drift from cooling towers that is expected to be called later. Now, if you wish to, we can get him now. I am asking the Florida Power & Light people to have a colloquy with him, or we can wait. How do you want to do that?

MR. STEEL: Mr. Chairman, we would suggest that it be later. We have our last witness now.

MR. STEIN: You can proceed in your own way.

MR. STEEL: Our last witness will be Mr. Autrey.

MR. STEIN: Would you keep Mr. Lyerly here, Mr. Steel?

MR. STEEL: Yes, we will keep Mr. Lyerly here.

GENE AUTREY, VICE PRESIDENT,
FLORIDA POWER & LIGHT COMPANY,
MIAMI, FLORIDA

Gene Autrey

MR. AUTREY: My name is Gene Autrey, and I am Vice President of the Florida Power & Light Company, in charge of the Miami area. We welcome and appreciate this opportunity to appear before your conference.

In view of some statements that were made yesterday, it is necessary for me to depart from my prepared statement in order to correct the record.

Dr. Tarzwell indicated that some 10,000 cubic feet per second would pass through the condensers. Dr. Tarzwell, so that you can correct your figure, if you are here, only 4250 cubic feet per second passes through the condensers and within a very short time, in fact on our existing plant site, the dilution water will be introduced.

Also, Dr. Lackey has clearly indicated on experiments conducted at Turkey using Biscayne Bay water, there is no detectable change in the microscopic organisms as they pass through the condensers.

There is another point upon which I want to focus very clearly. This plant will operate, and operate successfully, with the existing cooling system. The condensing and dilution system now under construction is being built to protect the enviornment, and in order to comply with the only numerical temperature standard currently in effect by any governmental authority having jurisdiction, and that is Dade County's 95° at the present time. But for the need of protecting the environment, and the proposed Biscayne National Monument, we could stop the draglines today.

We are proud of the efforts we have made in the preservation of our environment for the people of this area while, at the same time, providing vital electricity. From the very concept of Turkey Point, our Company has been dedicated to fulfilling those responsibilities.

We have established the following community facilities at Turkey Point:

1. Girl Scout Camp.
2. Boy Scount Camp.
3. Buttonwood Beach Picnic Area.
4. Areas for Public Fishing.
5. Nature Trails.
6. Homestead Power Squadron Facilities.

These developments have been enthusiastically received by the people of Dade County. The response to the picnic area has been particularly satisfying. It is booked well in advance for weekends during much of the year. More than 20,000 people have enjoyed the beaches, picnic shelters and other facilities here since the area was opened two years ago. Members of 175 different groups -- businesses, churches, clubs and other organizations have been represented -- plus many, many family groups.

As a result of the many requests to see Turkey Point, we started tours for civic and service clubs last year. Some 60 organizations and approximately 1,600 members have taken the tours, to get a firsthand look at the unique Turkey Point development.

In addition to the community areas, Turkey Point includes facilities developed by the Company as a contribution to the defense effort of our country. Here, the U.S. Air Force Tactical Air Command is teaching combat airmen the techniques of ditching and surviving at sea under actual conditions. Space made available by Florida Power & Light for a jump tower and boat docks enabled the Sea Survival School to shift its location from cold Chesapeake Bay to the warm waters of Biscayne Bay and Turkey Point lagoons for year-round operation. The company's offer of the plant site for training classes was hailed as a "classic example of cooperation between private industry and the military in time of crisis."

Also, Florida Power & Light has added further research into uses of powerplant cooling water in developing vitally needed marine food sources. In ponds developed by Florida Power & Light, the University of Miami's Institute of Marine Sciences is conducting research which may improve the shrimp's chances for a longer life. The goal is to discover how shrimp can be raised in captivity at a reasonable cost.

Four quarter-acre ponds, two half-acre and one one-acre pond have been built. Shrimp farming won't be the only research project the marine biologists will be conducting at Turkey Point. Later, research will begin on the care and feeding of pompano.

At this time I would like just a few representatives of the thousands of local people who have been to Turkey Point to tell you in their own words what they have seen and what they think of the area. However, due to the length of time the hearing has taken they were unable to stay; so in my part of the testimony there, the introduction of various groups, you can strike those out unless any of them are still here.

Tod, are you here? Would you come on at this time and give your talk?

MR. REED: I think all of us will be more than frank with you. We are very interested in hearing from the Boy Scouts, the Girl Scouts and any other group that want to tell us what a wonderful job that has been done for them in establishing the Boy Scout area and Girl Scout area on Turkey Point land.

I think in essence of time, I think we are all cognizant of this. We are talking about problems of temperature of the Bay and the velocity of water in the Bay, but you may proceed as you see fit.

MR. AUTREY: Thank you, Mr. Reed. The only thing I wanted to point out was Florida Power & Light is interested in the total environment of Dade County and the people therein.

This is Mr. Tod Swalm.

TOD SWALM, MANAGER,
HOMESTEAD CHAMBER OF COMMERCE,
HOMESTEAD, FLORIDA

Tod Swalm

MR. SWALM: Gentlemen, my name is Tod Swalm. I'm afraid that my credentials here are pretty slim. I am not a Ph.D. I am the manager of the Homestead-South Dade Chamber of Commerce, and a Homestead Rotary Club member. I represent some 350 businessmen and professional people in the area closest in proximity to Turkey Point.

We are the ones who are going to have to live with whatever Florida Power & Light does with Card Sound and South Biscayne Bay. We live in the immediate area, and I feel that we should be afforded the opportunity to express our opinion on the controversy in general, if not the biological specifics.

On February 27, 1967, almost 2 years to the day, 2 years ago to the day, our Board of Directors adopted a resolution addressed to the United States Atomic Energy Commission strongly supporting the application of the Florida Power & Light Company for a construction permit to build the Turkey Point nuclear powerplant. In the resolution, which we have not seen any reason to alter since then, we said:

"Florida Power & Light has kept the people in this area informed of its plans since the possibility of the plan was announced several years ago."

Tod Swalm

Now, this is 2 years ago, when this was adopted, so this is how long this situation has been going on. At least 5 years.

"We are satisfied that it will not destroy the beauty of our area and waterfront, but will, in fact, enchance it.

"As far as safety goes," which was the big bugaboo 2 years ago," we know that the Atomic Energy Commission is going into that aspect in great detail for the protection of the people and all proper safeguards that will be required.

"The addition of this plant will be a great step forward in the growth and expansion of South Dade County, and, in fact, all of Florida. It will be a tremendous assist in attracting new industry, which is greatly needed to balance the agricultural industry in Dade County.

"In view of the good housekeeping of their other plants and installations, we are confident that Florida Power & Light intends to make Turkey Point a model power generating plant.

"The Board of Directors of the Homestead Chamber of Commerce respectfully urges the Atomic Energy Commission to grant the application."

Tod Swalm

Which the Atomic Energy Commission subsequently did after full public hearings.

Two years ago the issue was nuclear safety, the possibility of accidental release of radioactive material into the environment, a bugaboo which has long since been laid to rest.

Now the new bugaboo is so-called thermal pollution. Could it be that the politicians, whatever party, are seeking headlines in the news media? Sometimes we laymen get this impression. Irregardless, as they say, we laymen may not understand the technology of the ecology, but we do understand the importance of the economy. We must have an adequate supply of electric power at the least possible cost to the consumer.

It seems as a layman the issue here, as it was with the Everglades Jetport, is one of second-guessing or changing rules in the middle of the ballgame. We are all for ecology and all for conservation, but to our mind it is plain stupid to try to make it retroactive after millions of dollars have been committed in the public interest.

Tod Swalm

Unfortunately, there have been gross violations against the environment in the past, and these two instances of the Everglades Jetport and Turkey Point may be harmful to some degree to the total environment, but the fact remains that both were started in good conscience, and represent multi-million dollar investments to serve the public, which will be erased if not permitted to achieve their maximum utilization.

What I am trying to say is this. Draw the line, and draw it now by clearly spelling out the conditions, but don't try what you are doing here to make it retroactive to destroy worthwhile projects already under way. If all powerplants should be built on the ocean shore rather than on bays or rivers, as has been suggested at this hearing by one of the Government witnesses, let's establish this by Federal legislation for years ahead, although I don't see how the midwestern States are going to be able to conform.

The conservation program, too long ignored, is making progress in Florida and in the Nation, but let's not lose our perspective. Man, people, humans have developed needs and environmental requirements over the years which must be recognized and provided.

Electricity is one of them. We believe Florida Power & Light knows what it is doing, and should be permitted to continue the construction program at Turkey Point "full steam ahead."

Thank you.

MR. REED: Mr. Swalm, did you or the Homestead Chamber of Commerce support the creation of Biscayne National Monument?

MR. SWALM: Repeat the question, please.

MR. REED: Did you or did the Homestead Chamber of Commerce support the creation of the Biscayne National Monument?

MR. SWALM: I am glad you asked that question. We did not. We opposed it in Tallahassee, and we opposed it in Washington, and now it is an albatross around Dade County's back.

MR. STEIN: I think we understand your view, Mr. Swalm. I don't want to attribute this to the company, but I do want to let you in on a secret. In the Federal Water Pollution Control Administration we are usually concerned with the retroactive cleanup of the environment after it has been fouled up. We are trying to prevent it here.

Tod Swalm

You can have your own view, but one other point I want to make and I hope we can get up to this. I don't want to anticipate Mr. Autrey's next statement in which he says, "I believe you will agree that we are fulfilling our responsibility of preserving the environment for its enjoyment by the public."

I think no one is impugning the company that they are not proceeding in good faith. No one has said that. However, I don't know why you have the view that you do -- that you think someone is coming here for headlines. You are thinking that we are not here in good faith, or thinking that the industry is not proceeding in good faith.

I believe if you're going to say that or imply it, you should have something to back it up. These are serious accusations. These people here are Government servants. Myself, and I know Mr. Thoman here, have been in Government service for almost 30 years. I have taken an oath to support the law and I try to carry it out. The idea that we are not coming here in good faith or that we are trying to give an unfair hearing or trying to set a "bugabear" about something just doesn't go.

We are here for what we consider a real important problem. From the response that I have heard from the industry and the activity that they have engaged in, I think that they also consider it an important one.

MR. SWALM: I am sure that is true and I accept that.

Letme make one final statement. There is no doubt in my mind that the pendulum in the past, as far as conservation and the environment is concerned, swung too far one way. Now, however, I think that it is swinging too far the other way.

MR. STEIN: All right. Thank you.

MR. AUTREY: Mr. Stein, the statement "I believe you will agree that we are fulfilling our responsibility of preserving the environment for its enjoyment by the public" was, of course, to be made after these other people had come on. I think you will agree that we had a number of people, Nat.

MR. REED: Absolutely.

MR. AUTREY: I want to make clear that these are Mr. Swalm's statements. The company is not against the Biscayne National Monument.

MR. REED: I recognize that.

MR. AUTREY: It is inconceivable that after such a concept has been made into a workable, living thing, that we would destroy the very thing we have worked so hard to develop. We at Florida Power & Light Company take our citizen responsibilities seriously and are keenly aware of our role.

Earlier you heard Col. Davis' statement, as well as testimony of outstanding experts in their fields, regarding the cooling canal system at Turkey Point. You have a chronology of events at Turkey Point detailing the long road to this point in our earnest efforts to supply the people of Dade County with dependable, adequate electricity.

Incidentally, we also supply in excess of 16,000 KW to our neighbors to the south in Monroe County. This is more than 60 percent of the electrical needs for the Keys Electric Cooperative which serves the upper and middle Keys area. We enjoy an outstanding relationship with these folks.

I think it is important to point out that this environment question was recognized long ago by our local government, and they have been leaders in doing something about it.

Gene Autrey

1. A strict pollution control law was passed and hailed as one of the best in the country.

2. A Pollution Control officer was appointed to enforce that law.

3. A Pollution Control Board of citizens -- highly qualified, technical people who are professionals in their fields -- was appointed by the Metropolitan Dade County Commission.

The local government worked with local conservation groups to devise a board whose members had scientific expertise.

The Pollution Control Board recently rendered a favorable, unanimous decision on our planned cooling system. This was done after months of long and arduous public hearings. They heard sworn testimony from many experts. To quote Dr. Beck (a member of the Board with a Ph.D in biology) when voting for the canal system:

"To add to what has been stated, it has been pointed out that proof that this system will not work or is not satisfactory lies upon the appellants, and the evidence that has been presented, scientific data, has not been given under adequate control conditions. They are not valid scientific conditions. So they are certainly subject to question. There hasn't been any proof that this system will not work."

This board concluded their hearings less than a week ago. These hearings were public. Any evidence submitted here by the Federal Water Pollution Control Administration could have been submitted before that board.

I believe you will find the report on Thermal Pollution of Intrastate Waters of Biscayne Bay, by U.S. Department of Interior, dated February 1970, is simply plowing over much of the same ground that was thoroughly explored by this board. Representatives of the Department of Interior testified before the board, including U.S. Fish and Wildlife, National Parks Service and Federal Water Pollution Control Administration. Some of the hearings were attended by representatives of the Florida Air and Water Pollution Control Department. If there is disagreement with the board decision there is an appeal route to the circuit court.

Gentlemen, I believe it has been amply proven that local government, local business and local conservation groups have served the people well here in Dade County, and we have set a pattern of environmental protection and enhancement that could well serve as an example for other communities.

In conclusion: Florida Power & Light Company has a dual responsibility to this community -- to provide necessary electric service and, at the same time, to help preserve and protect our natural environment. We are doing our best to meet these responsibilities to the public at Turkey Point.

I would like to reemphasize what Col. Davis has already said about our concern for the protection of the proposed Islandia National Monument. This was an important consideration in our decision to construct the dilution canal to Card Sound -- to remove the discharge from the proposed Islandia National Monument.

Also, the canal removes the discharge from a highly productive area to a less productive area, and it removes the discharge to an area which has been designated for the heavy-duty seaport which is needed for the economic development of Dade County. In fact, the Act of Congress creating the proposed Islandia National Monument specifically reserved an easement into Card Sound from the ocean for a deep water canal to serve this heavy-duty seaport.

Bob, if you will show that across the map here.

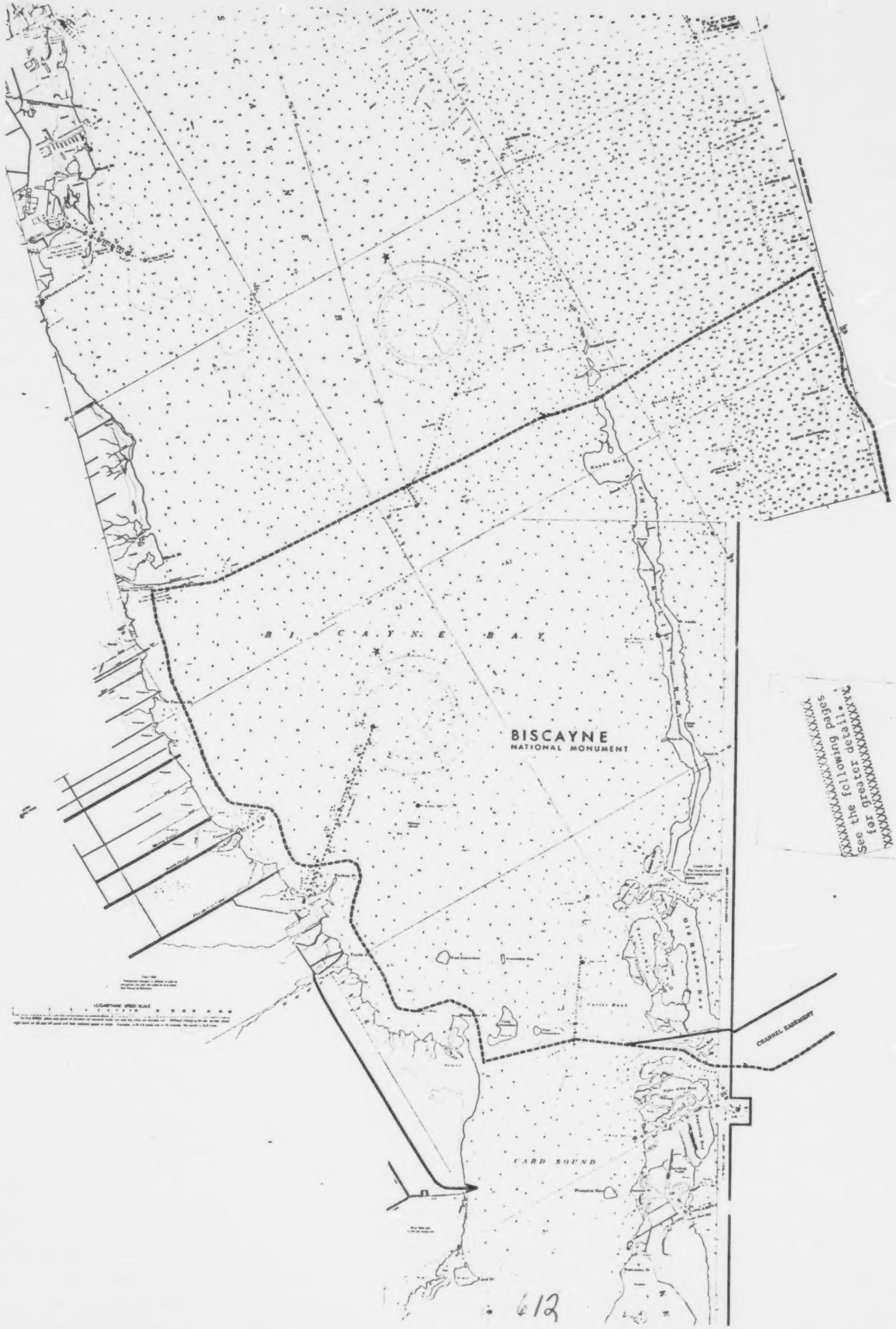
MR. STEIN: Could we have a picture of that for the record?

MR. AUTREY: Yes, sir.

MR. STEIN: Otherwise the transcript won't make sense.

MR. AUTREY: We'll have some for the record.

(The above-mentioned photograph follows.)


BISCAYNE BAY
BISCAYNE
NATIONAL MONUMENT
CARD SOUND
CHANNEL EASEMENT
LOGARITHMIC SPEED SCALE

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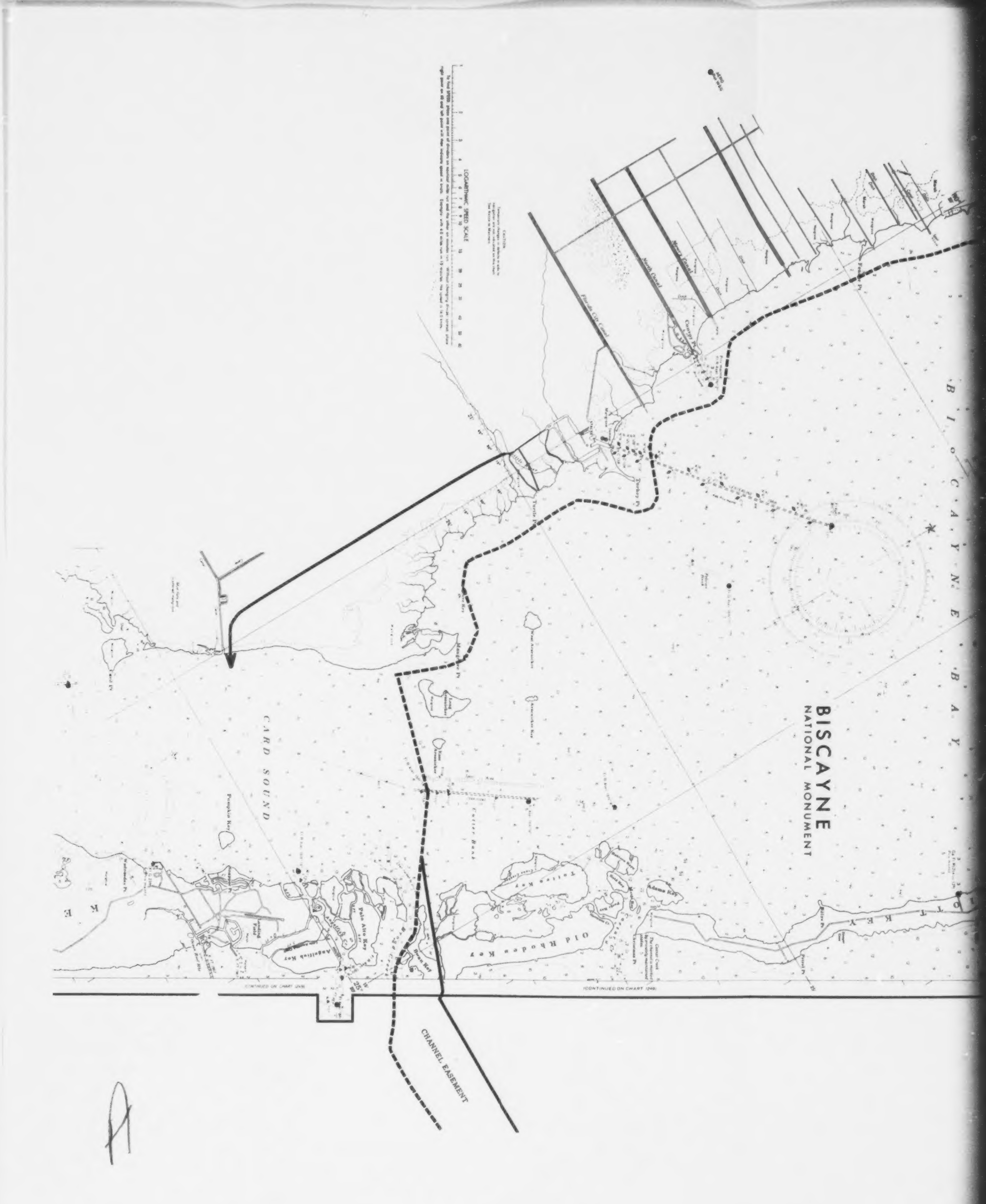
See the following pages
for greater detail.
XXXXXXXXXXXXXXXXXXXXXX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NATIONAL MONUMENT
BISCAYNE BAY
CARD SOUND
CHANNEL EASEMENT
LOGARITHMIC SPEED SCALE
CAUTION
Florida City Canal
North Canal
Mowry Canal
Convoy Pt
Turkey Pt
Turtle Pt
Card Pt
Pumpkin Key
Arsenicker Keys
West Arsenicker
Long Arsenicker
Cutter Bank
Totten Key
Adams Key
Old Rhodes Key
Palo Alto Key
Angelfish Key
Angelfish Cr
Elliott Key
CONTINUED ON CHART 1249

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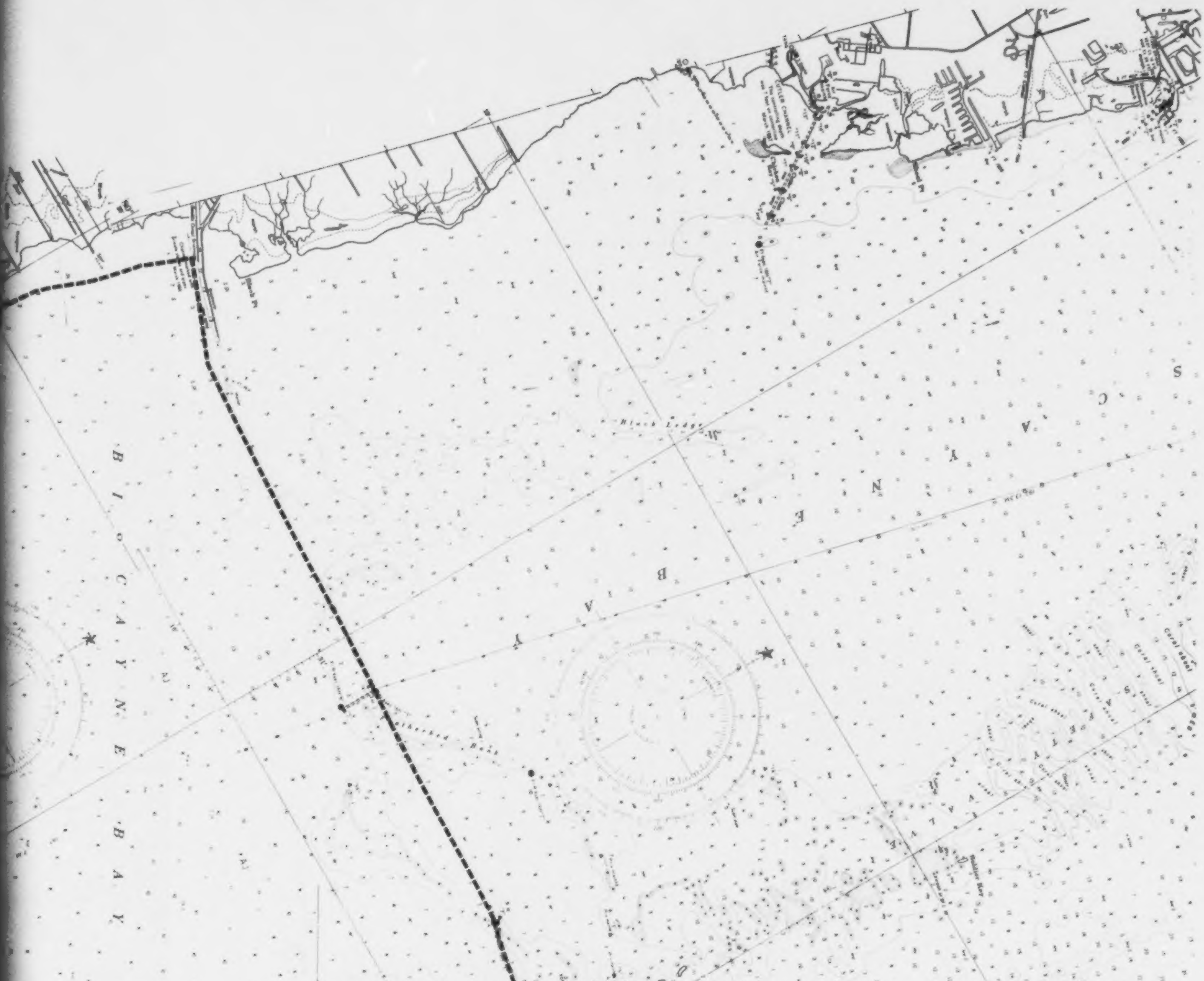
BISCAYNE BAY
Black Ledge
BISCAYNE BAY
SAFETY VALVE
Coral shoal
Elliott Key

612

B

Gene Autrey

If South Florida is to have the electric power it needs in the summer of 1971, our third generating unit at Turkey Point must be tested and in operation by that time.

Please consider this chart which shows in thousands of kilowatts the electric load and capability of the Florida Power & Light system for the 10-year period, 1965-1974. Note that up to the present we have maintained a reserve of capability over load. This is vital to the people we are serving -- some 3,000,000 strong and, of course, still growing.

It is essential because no system can operate continuously on its maximum normal rated capabilities. We must expect some loss in capability because of plant maintenance and normal shutdowns for repairs. As you can see, without Turkey Point Unit No. 3 we would be faced with a critical situation.

Our cooling water canal extension must be completed by that date for us to meet county water temperature requirement of 95°. And by that date I'm talking about July of 1971, because our variance that has been obtained from the Metropolitan Pollution Control Board is only until July of 1971.

Gene Autrey

As Col. Davis stated:

"The scientists conducting this study have testified in public that the research has not progressed to the point that the cause of the damage can be positively identified as excess temperature, nor are the scientists able to say at what temperature damage will occur."

We are planning to meet the only known temperature standard in existence; that is, Dade County's 95°. We are confident from our own studies that there will be no degradation at this temperature.

Various water cooling plans were studied and reviewed by many authorities through numerous and lengthy hearings, and this is the only proven cooling system that can be constructed and placed in operation by July 1971, to meet this requirement. The canal-dilution plan has received approval from the Dade County Pollution Control officer. He has imposed strict requirements on this project to assure that the area's marine life is protected, and we intend to take whatever steps are necessary to see that the water cooling project does its job properly.

Gene Autrey

I would like to enter for the record Mr. Leach's letter of conditional approval, and I quote Items 4 and 5 therein.

MR. STEIN: Without objection this letter will be entered into the record as read.

(The above-mentioned letter follows.)

METROPOLITAN DADE COUNTY • FLORIDA

864 N. W. 23RD STREET
MIAMI, FLORIDA 33127
TELEPHONE 377-5891

DADE COUNTY POLLUTION CONTROL

December 5, 1969

Mr. A. J. Bingaman, P.E.
Bechtel Corporation
Florida Power and Light Company
4200 West Flagler Street
Miami, Florida

Gentlemen:

After a thorough review of plans and specifications accompanying your application for "Authority to Construct" a cooling water discharge system to serve the Turkey Point electrical generators 1, 2, 3 and 4, we are approving the system subject to the following conditions:

1. The five (5) axial flow pumps specified shall be so designed to have a capacity of approximately 840 cubic feet per second, instead of 785 cubic feet per second as specified at 3.6 feet T.D.H.

2. There shall be supplied one additional pump over the five proposed which shall be in a place and ready for operation so that regular maintenance may be accomplished on those in service without any loss in pumping capacity.

3. An additional three (3) pumps shall be supplied within six (6) months, upon notice by this office that such are needed to increase the dilution capacity by an additional fifty per cent (50%).

4. The Florida Power and Light Company shall submit a plan for a system of water temperature monitors to the Pollution Control Department to provide a satisfactory monitoring system which will provide the department with continuous information concerning ambient conditions in the total cooling water system.

5. The Florida Power and Light Company shall fund the necessary ecological and hydrological studies of lower Biscayne Bay and Card Sound commencing April 1, 1970 and continuing for at least one (1) year after all

units of the facility are in operation. These studies, prior to initiation, shall be agreed upon by the U. S. Department of the Interior - Federal Water Pollution Control Administration, State of Florida Department of Air and Water Pollution Control, Dade County Pollution Control Department and the Florida Power and Light Company.

Accepting a permit for, or commencing any construction under the provisions of this "Authority to Construct" shall constitute acquiscence on the part of the applicant to all conditions contained herein.

Very truly yours,

Paul William Leach

Paul William Leach
Pollution Control Officer

PWL:nea

MR. AUTREY: For the information of the folks that are in the room there are other conditions other than No. 4 and No. 5, but I really don't think that they are technical problems of the pumps, and that sort of thing, and I don't think they bear on the question

On this subject I would like to enter our President's letter to the Dade County Pollution Control Board.

MR. STEIN: Without objection this letter will appear in the record as if read.

(The above-mentioned letter follows.)

FPL
FLORIDA POWER & LIGHT COMPANY

January 14, 1970

Members of the Metropolitan Dade County
Pollution Control Hearing Board
Miami, Florida

Dear Members:

We at Florida Power & Light Company are determined to protect the environment in the areas where we are privileged to work. We have spent several hundred thousand dollars obtaining reports and studies from leading universities, and scientific, professional and engineering firms who are experts in the technological aspects of the effect of heated discharges on the environment and the means of their control.

These studies and reports have been conducted over a period of years beginning as far back as 1966. We have explored before interested public agencies every available means of reducing the temperature of the discharge waters. Our plans were presented to the prior Pollution Control Board of Dade County which granted us a variance, and this variance was upheld by the County Commission. Subsequently, the present Pollution Control Board, made up of persons with scientific expertise, was appointed and we have appeared before you on numerous occasions, exhaustively exploring all of the alternate cooling methods.

After these years of study and evaluation and with the recommendation of the scientists and engineering firms, it has been determined that the most practical and feasible means of reducing the cooling water discharge to an acceptable temperature is by means of an extended canal and dilution system. The results of these studies have been made available to every applicable County, State and Federal agency, and many of them are on official public records of hearings on this subject.

The Dade County Pollution Control Officer's approval of the canal permit has imposed on our company the following strigent safeguards:

1. A 4-year study of the ecology and hydrology of Card Sound to be funded by Florida Power & Light Company and to be acceptable to Dade County, the State of Florida and the Department of Interior.

2. A Temperature monitoring system satisfactory to the Pollution Control Officer and to be installed at our expense.

These safeguards together with the Pollution Control Officer's continuing surveillance of the water being discharged, and together with the permit svstem which is being placed in effect by the Florida Department of Air and Water Pollution Control, gives both the County and the State completely adequate means to protect the environmental values of Dade County.

I would like to restate that should the results of the above studies demonstrate that further temperature reduction of the heated discharge is necessary, Florida Power & Light Company will promptly take steps to make the modifications required to effect the reduction.

We are continuing to study the technological aspects of cooling water temperature reduction in cooperation with interested public agencies in order that any new developments in this area can promptly be evaluated.

We wish to inform the Board that at this time we have complied with all the conditions imposed by you on the granting of an extension of time for compliance, and commencement of canal construction is scheduled for February 1, 1970.

It is imperative that the two present plants continue to operate and the additional units remain on their present schedule in order that the electric power needs of Dade County can more nearly be satisfied.

I urge you that you deny these appeals so that we may proceed in an orderly fashion with our construction and further studies.

Sincerely yours,

R. C. Fullerton
President & Chief Executive Officer

RCF:bk

METROPOLITAN DADE COUNTY POLLUTION CONTROL HEARING BOARD

In re: : ORDER NO.

Appeals of JAMES F. REDFORD, :
JR.; MANGROVE CHAPTER,
IZAAK WALTON LEAGUE OF :
AMERICA; and SEADADE
INDUSTRIES, INC. :

. . . . :

ORDER

The above consolidated appeals were heard by this Board at a series of public hearings in which testimony on behalf of all parties was received. All members of this Board voting on this Order have either attended all of said hearings or have read the transcripts thereof.

The appeals herein were taken from a decision of the Dade County Pollution Control Officer embodied in a letter Order dated December 5, 1969, a copy of which is attached hereto. The appellants have raised two issues for resolution herein. They are whether the proposed Florida Power and Light Company cooling canal emptying into Card Sound will, when accomplished as set forth in approved plans and placed into operation, violate the temperature standards set forth in the Dade County Water Quality Standards (Section 24-11(3), Dade County Code) or cause water pollution as defined in Section 24-11(3), Dade County Code.

The Order of the Pollution Control Officer is presumed by the law to be valid and correct. The burden of proving to the contrary is on the appellants herein.

FINDINGS OF FACT

After consideration of the testimony of all witnesses herein, it is the finding of this Board that appellants have failed to demonstrate that the proposed cooling canal will violate the Dade County Code provisions proscribing water pollution. This is particularly true considering the safeguards contained in the Order of the Pollution Control Officer which is the subject of this appeal.

However, the testimony of the witnesses has demonstrated that a possibility, however remote, does exist that the proposed cooling canal, when its operation is begun, may not be as effective as its designers expect, particularly during the summer months when the ambient temperature of Biscayne Bay is at its highest peak.

CONCLUSIONS OF LAW

This Board does not have the legal authority to allow the appellee to pollute the waters of Dade County. Any Order entered by this Board cannot permit Florida Power and Light Company to violate any standards, thermal or otherwise, of the Dade County Code. Consequently, any approval by this Board of a proposed cooling system cannot restrict proper action by the Pollution Control Officer against Florida Power and Light Company should it develop that the cooling canal does not justify its designers' expectations, or should it develop that additional anti-pollution measures are necessary in the future under the Dade County Code as it exists at that time.

Accordingly, it is

ORDERED that the Order of the Pollution Control Officer, a copy of which is attached hereto, is affirmed, subject to the following modifications:

1. The studies required by the said Order of the Pollution Control Officer shall begin no later than April 1, 1970. If any agencies set forth in said Order have not agreed to the studies by April 1, 1970, the Pollution Control Officer shall set forth a procedure for said studies and such shall be carried out under his supervision.

2. That an interim report developed from such studies shall be submitted to the Pollution Control Officer for evaluation and approval prior to any testing or operation of Florida Power and Light Company's Unit No. 4 (nuclear unit no. 2). TPH

3. That should such interim report indicate the need for supplementary facilities to assure compliance with the Dade County Code, said facilities shall be designed and in construction within six months of an order to proceed therewith issued by the Pollution Control Officer.

DONE and ORDERED this 19 day of Feb, 1970.

Thomas P. Hughes
Chairman, Metropolitan Dade County
Pollution Control Hearing Board

ATTEST:

Lucy K. Rosengren
Clerk

Gene Autrey

MR. AUTREY: If I may, in my quote here, in my prepared talk, I did not cover No. 1, and it may be well at this point because of the statements that we make later on, that I would like to cover point No. 1.

(Whereupon, Mr. Autrey read No. 1 and No. 2 from the order.)

MR. AUTREY: Now, what this says, in effect, is that the Florida Power & Light Company, which is now operating two fossil fuel units at Turkey Point on a system that has a cooling system that will operate and operate engineering and electricalwise with the existing cooling system, as well as the No. 3 and No. 4 units, will also operate sucessfully, and will operate with some loss of efficiency possibly due to recirculation, but will still operate.

What this means is that before we put No. 4 unit on the line, it will be practically a year from the time that No. 3 unit goes on the line; that there must be an interim study made where No. 3 unit gets on the line until No. 4 unit gets on the line, and this schedule must be turned over to the Pollution Control officer, and if there is any indication that this system is not operating according to the information and engineering and scientific data, the Florida Power & Light Company will have to do something before the No. 4 unit goes on.

Now, what this means also is that what we are trying to do, as we are trying to point out, that we are taking steps in this environmental problem. We are extremely interested in it, and we are trying our best to go step by step so that these things can be done.

These safeguards and requirements in effect require us to supply a field laboratory, under controlled conditions in this hearing today, for all concerned to gain more knowledge of thermal effects. We again are confident that this study will confirm the 95° standard.

We are enthusiastic about being part of a plan that not only insures protection of the environment, but promises to provide vital information on a subject that is of concern to this community as well as to the State and to the Nation.

Mr. Stein and Mr. Reed, I would like to tell you that we welcome the opportunity to join with you folks to implement such a plan; to put it in effect, and study this thing, and let's go ahead with this system so that we can do both things. And that is to protect the environment that we all want and provide the electricity that we all want also, obviously.

Thank you.

MR. STEIN: Thank you, Mr. Autrey. Are there any comments or questions?

MR. REED: No.

MR. THOMAN: No.

MR. STEIN: Let me say, Mr. Autrey, I think we have just a few. One quote that you made emphasized that there hasn't been any proof that this system will not work. I want to make this clear to you, the question is that the conferees are going to have to decide at this point whether they take that view or if they will feel that they have to have proof the system, in fact, will work before they go ahead.

Now, this I think is a fundamental point: In working with the company, we must recognize that the company has given a lot of thought to the problem. The company has also done what it considers undertaking its interest in a program of protecting the environment.

The question that the conferees face all the issues at stake, including the plan that is developed by the Federal and State conferees, in order to carry out their responsibilities.

Then there's just one other little point, and that is that if the thing doesn't work -- and I know every public-minded body does this -- you're going to construct facilities within six months. In my experience, I never have been too happy with a corrective measure like that, because no one can tell whether you'll have a year or two of design if you run into a problem.

What you want is the best result. You can't tell whether a solution can be reached in six months. We also have a small procedural problem. We have to really look at this. Again, at least for us and the company recognizing the work that you have done in the past, I think we would like to try to come up with some kind of operation or mode of operation whereby we can both move forward together. I would hope that we would not be too far apart.

As I look at the temperatures here, I don't believe that we are that far apart that the solution will be beyond our reach.

MR. AUTREY: I understand, Mr. Stein, and I'm delighted. I think that's the tone that the Florida

Power & Light Company ought to conclude with today, but I would like to answer your question, and let's pursue that extremely vital question sitting here.

Certainly you gentlemen are here to try to resolve the problem that is going to affect the entire Nation, and I think that is extremely germane to what we are talking about. I think Mr. Reed and the Governor have invited you here for that very fact, and we understand that, and we want to cooperate with every governmental agency that we possibly can.

Now, here is what we have facing us, however, in the Florida Power & Light Company, and I think that it is important to recognize that this really gets down to the point where we are. The Florida Power & Light Company is operating 2 fossil fuel units at Turkey Point at the present time, which are violating, as far as temperature requirements, the Pollution Control Ordinance of Dade County, which, however, has given us a variance of 95°. We are exceeding that, and we have a variance to exceed that until July of 1971.

Now, if we do not proceed with some type of cooling system for the environment -- now, that is extremely important to understand -- some type of cooling system for the environment, come July of 1971, we are going to have demands made upon us by the public for electric power, and we are going to have a No. 3 unit, which is the first nuclear unit at Turkey Point sitting there ready to operate with a large amount of electric power for the people of Dade County and for the rest of the State, for that matter.

Now, that plant can operate with the existing cooling system. If we operate it, we will not have a variance to operate it, and if there is any problem with heat or any problem at all exceeding the temperature requirements now, it is going to be more, perhaps, I think you will agree. We don't want that to happen. I don't think you want that to happen.

I think in all sincerity we are here as people trying to arrive at a mutual solution. We don't want that to happen. We know the folks want electricity. We know we have to supply it, and that is our responsibility, and it is your responsibility to see that we don't hurt the environment or degradation of the environment, and we certainly concur.

So we have to move and try to protect that environment. That's why we are building that canal, and the canal in any event is an integral part of the field laboratory that we are talking about to be able to get these answers, and when that No. 3 unit comes on, and if that canal is built and is in operation, and the No. 3 unit is tested and operates in July of 1971, we certainly, as pointed out by Mr. Nelson, of the Pollution Control Board, we certainly hope that the system is going to work with just 3 units operating. Now, we have got devices on it for studying, monitoring the system. We had field studies made before the canal ever got down there, and then we proceed to operate that 1, 2 and 3 units for one year; and certainly in that summer of 1971 we are going to get a lot of valuable data. We are not going to just slough the area down there. We are going to have a lot of information before that No. 4 unit comes up, and we think when we put No. 4 unit up and continue these studies another year, which is under the control of the Pollution -- these studies funded by Florida Power & Light -- we figure that the unit will operate for 1 solid year while we are doing that study.

Now, supposing that it doesn't work, and that is the question that is bothering you gentlemen, as dedicated folks that are supposed to see that this situation is going to operate. Supposing it doesn't. We have 2 years in which you know that there is research going on all over the country. This is an extremely vital point that we must understand, and I think you do, and I think it is important for everyone to understand; that all over the country this problem is being studied by engineers and scientists, and certainly with the expertise that is here in the United States, and in 2 years we are going to find supplemental cooling systems, but in any event the canal system is an important part of the supplemental cooling system.

There is just not enough time for any other kind of design or any other kind of system. That is why we have gone ahead with the first portion of this canal. We have gotten every possible permit from any governmental authority. We are not trying to push ourselves. We are caught in a horrible position of trying to fulfill a dual responsibility, and I think it is important for you folks to realize that we are going to get every possible permit that we are asking. We are not trying to put any public officials on the spot at all. We are simply trying to cooperate in every way we can.

I wrote Mr. Vince Patton, I believe, of Mr. Reed's office over there, that we would do that just as soon -- did I not, Nat?

MR. REED: Yes.

MR. AUTREY: Just as soon as you got your system going, we would move in and take out the necessary permits to try to solve this problem, and I want to pledge to you that we recognize keenly our responsibility to the environment and to serve electricity for this community, and I hope that answers your question, Mr. Stein.

MR. STEIN: It does, and your attitude is commendable. But I am obliged to say one thing: There is a reference possibly made by Col. Davis that he had been to a lot of hearings before. I looked at the record. This isn't like any other hearing. The point is we did not stop yesterday with the announcement that I made under the direction of the Secretary. That procedure is in motion.

Now, the issue that I think that we have here, vis-a-vis, the Federal Government, and the State on this matter, is that the Federal officials back in Washington are looking for an expression from you people that you are going to stop building the canal. If there isn't one indicated, you might take the consequences; but there would be some action. I have to say that as far as I know that is in motion. We will try to move forward with this. As long as I am in charge, I will move forward through all aspects of this in as amicable a way as we possibly can. But I would think that you should be looking for an answer.

MR. AUTREY: Well, of course, as you know, I made a public statement that we have taken the motion under -- your "request," I guess. Someone said it looks stronger than a request.

MR. STEIN: That is right.

MR. AUTREY: But I think we certainly have it under careful consideration, and I want you to know that whatever decision we make, Mr. Stein, that we are making it in good faith, and we are just trying to discharge our dual responsibilities which we are very keenly aware of.

One last point before I guess we break for lunch, and that is I am getting confused because your name tags are a little bit different there.

Thank you very kindly.

MR. STEIN: Thank you for your statement.

MR. REED: Mr. Stein, I would ask the indulgence of members of the Board, because of the schedule this afternoon -- we have a long schedule this afternoon -- I would like to call on one other person in the audience who is on an inflexible time schedule and cannot appear this afternoon, who very much wishes to appear this morning. It is now 12:35. So I would ask if he could speak, and then we could break for a short luncheon recess. I would be appreciative of it.

I'll call Dr. Gilbert Voss.

DR. GILBERT VOSS,
PROFESSOR OF MARINE SCIENCES,
CHAIRMAN, DIVISION OF BIOLOGICAL SCIENCES,
INSTITUTE OF MARINE SCIENCES, UNIVERSITY
OF MIAMI, MIAMI, FLORIDA

DR. VOSS: Mr. Chairman, ladies and gentlemen, my name is Gilbert L. Voss. I am Chairman of the Division of Biological Sciences at the Institute of Marine Sciences, University of Miami, and a professor of Marine Sciences at the Institute.

Dr. Gilbert Voss

But I wish to speak to you today only as Chairman of the Committee on Inshore Estuarine Pollution of the Hoover Foundation and as a biologist and citizen of Dade County. My statement in no way reflects the opinions or policy of the University of Miami or the Rosensteil School of Marine and Atmospheric Sciences.

I suppose all of you have read the Hoover Committee report, including the substantiating addendum. This committee and its charge from the Hoover Foundation is perhaps unique in that it was composed entirely of research scientists all familiar with the area and the problem, but mostly because it was ordered to address itself to the effect of elevated temperatures on the biology of tropical marine organisms with special reference to South Florida.

The committee was composed of 10 scientists all familiar with the biological problems or related aspects and with long experience in the area. The meeting at which the present subject was discussed occupied only 1½ days, February 24 and 25, 1969, but many days of work before and after the meeting went into the final report. In addition, the decisions were all unanimous. While two of the members could not attend the meeting, they submitted comments and reports, and all members saw the entire draft before signing the document.

Now, there has been considerable discussion, I understand, and statements made yesterday afternoon, unfortunately after I had left, concerning this report, the way it was presented, and the fact that there was supposed to be bias in the report.

I would like to state to you how this committee operated, and the subsequent events concerning the report. We were requested by the Metro Commission to consider this subject -- not Turkey Point. We considered only the problem of elevated temperatures; the higher ranges of marine organisms. That was the sole subject that concerned us as biologists. In fact, there was no discussion of Turkey Point or the present facility during the meeting. This was ruled out.

The report, when it was completed -- and we had only a short time after the meeting to submit this to the Metro Commission. It did not have the documentation of which it presently has.

Dr. Gilbert Voss

It was presented by me to the Metro Commission without this documentation, with a statement that this would be supplied if they requested it. They did not, nor was it requested at the time that the meeting was held and when we questioned them concerning it.

When the report was in the hands of Florida Power & Light, Mr. McGregor Smith wrote a letter to the Director of the Institute of Marine Sciences wanting to know the conditions under which scientists from the Institute of Marine Sciences would make statements concerning thermal pollution.

His old friend of long standing replied to this, and this is now in the records as given yesterday. I want to point out that three of the members of the committee are chairmen of the divisions at the Institute of Marine Sciences, and most of us were members of the faculty and still are.

This report -- this letter, pardon me, a copy was also sent to the Metro Commission, to Mr. Hardy Matheson. The report was turned down, as I understand, by the Metro Commission because it did not have the documentation that they said they would not require.

It was then submitted to the State Legislature by the Hoover Foundation. I did not appear. It is my understanding that it was again turned down in the State Legislature via conservation committee because it did not have documentation, which was being prepared and subsequently was prepared, and it was my understanding that there was lobbying against it, and the Sunshine Law, in fact, was quoted because it was reported that this was a secret meeting.

There are no secret meetings with scientists when they meet together to discuss scientific subjects; so that this was not a situation -- it was turned down by the State Legislature because of this lobby.

Later it was presented to the Pollution Control Board, because it was supposed to be a document from a secret meeting, and this was overruled by the Pollution Control Board, and it was admitted as evidence into the record.

Now, I understand yesterday after all of these events that had taken place, that it was stated that it really should not be concerned because it had been turned down by Metro, by the State Legislature, and only under a ruling from the Control Board did they recieve it.

Dr. Gilbert Voss

Now, as to the results of this. It has not been questioned, to my knowledge, by any scientists as to the validity of this report in substance. The only one that I know of was the statement that it was, as I understand, yesterday, that it was questioned by Col. Davis who does not have the qualifications to question the document. He is not a scientist.

The only questions which were raised under oath to the Pollution Control Board were by Dr. Wurtz and Dr. Gunter, and I would like to go over these very briefly.

In Dr. Wurtz' statement on 12 February 1970, he stated that we said temperatures should not exceed 90°F. He discredits this by stating that his data shows that no life was destroyed at Turkey Point by temperatures higher than this. Dr. Wurtz is welcome to make the statement; data have been shown that clearly shows that life has been destroyed by elevated temperatures at Turkey Point. I need to make no comment on this.

Dr. Wurtz has also drawn attention to supposed discrepancies in statements taken from a paper by Dr. Gunter covering the range of temperature at which life processes are carried out, 32° to 95°F for the majority of marine organisms and the thermal death point of shoreline and intertidal organisms, 107.6°F to 113°F, and a statement in my verbal testimony stating that these shoreline species are already eliminated at Turkey Point.

This criticism is due to an inaccuracy in the court recording. What I had said was essentially the same as stated above: Shoreline and intertidal species were eliminated from study by the Hoover Commission because of their tolerance of high temperatures. They are not of importance to the ecology of the bay. I am talking about the biological ecology. These were eliminated from our study. We concerned ourselves only with the benthic organisms.

The question of survival of certain species of algae at the present time down in the Grand Canal has little bearing here; nor does it in any way refute the report of the Hoover Committee.

Finally, Dr. Wurtz referred to a statement that I have an ecological map showing the distribution of bottom growths. On the basis of this, which he has never seen, he presumes that it is illogical, however, that turtle grass would be uniformly distributed over the entire bottom. He finishes with "It is possible we are comparing oranges with apples." It would be difficult to find a greater scientific non sequitur than that. I don't know what he is referring to.

In the criticism of the Hoover report by Dr. Gunter, a friend of mine of long standing and whose scientific acumen I admire, I find little to comment upon because his statements are not applicable to the tropical enviornment, and his opening paragraph shows adequately that he is not conversant with recent literature and research in the tropical environment. In attempting to draw correlations between the effect of heat upon animals and plants along the Gulf coast of Texas and Mississippi and of South Florida, he is indeed, to quote Dr. Wurtz, "comparing oranges with apples."

The futility of drawing comparisons between the tropics and the temperate region has been fully discussed in the Hoover report, and I see no need to go further into it here.

The rest of Dr. Gunter's statement is concerned with his personal beliefs and philosphy and can hardly be taken as substantiated scientific facts. The situation we are faced with here in Biscayne Bay and the tropics in general is not one of occasional cold spells or intermittent 10-year recurrences of Red Tide, but one of steady, continued, gradually increasing thermal pollution allowing only temporary seasonal relief with ever-mounting summer peaks of longer and longer duration. The two kinds of phenomena are not comparable.

These, to my knowledge, are the only scientific criticisms of this report. If you read the report carefully you will find that we state that 90°F is the level which we recommend that thermal additions should not increase.

The reason for this is that even below this temperature there are already certain effects which are created upon the larval and early juvenile stages which are detrimental. At 90° we begin to find some lethal effects on the larger number of benthic bottom organisms.

There is a bibliography of over 1800 citations in the literature concerning the effects of elevated temperatures. A small part of these are related to the tropics. We have gone through the literature. We have taken out what was in the literature on this. We have taken out from personal information, from data in our own files, and from field observations and from the laboratory.

Dr. Bourne, of the Pollution Control Board, challenged that our work was all related to tests which were made in the laboratory and not in the field and asked me if I did not feel that these should be supported by field observations. I certainly do. I did then and I do now. It does not change the fact that about half the observations as given in the records in the Hoover report were from field studies and about half of them are from laboratory studies.

We went into the study with no bias whatsoever concerning anyone, any place, any organization. We studied the problem of elevated temperatures in the tropical regions. When we had come up with the results and tabulated these and found at what levels various changes occureed, we then prepared a recommendation to Dade County as to what we felt should be the enforcement regulations and the background for this in any steam generating plant, and this was done not because of Turkey Point directly. It was done because there are going to be many generating plants built in South Florida in the tropical regions in the next two decades, I'm sure of this. There are various plants besides the one planned at Turkey Point.

Although these recommendations may not be able to be applied and enforced as far as Turkey Point is concerned, they absolutely must be considered and be applied in the site selection construction of generating plants in the future.

If we do not, we will find through necessity our environment continually whittled away and whittled away because it is too expensive to change, because the site was inappropriately chosen, and we are in a position where we are going to destroy our habitat.

Now, I would like to point out that people have said Biscayne Bay is one of the last areas which is unpolluted, etc. It isn't so. Only the lower part of Biscayne Bay is left unpolluted. All the rest of it is heavily polluted, and there is at the present time really no effective steps being taken to even clear it up, and most of our municipalities -- Miami Beach in particular -- are flagrant in their violations. We cannot afford to continue to let this kind of thing happen with our environment. It will not be long at the rate we are going if Turkey Point is not able to control the temperature, which personally I doubt, before we will have it thermally polluted.

We will have -- it has been estimated -- something like 400,000 people added to the population of South Dade County, according to the plans that are presently under consideration, and I believe been partly approved by the Metro Commission.

Where are the outfalls going to be? What kind of treatment is going to be given to these? What is going to be the burden upon the taxpayer of Dade County to take care of the lack of planning of the Metro Commission in allowing such a thing to go through, and then having to build super highways and everything else, and most of these people will not be paying taxes in Dade County.

Now, I would like to go a little further with this. In 1968 in a statement before the Pollution Control Board, where we had the first indications that damage had occurred in this area, I made a statement and a prediction, and I would like to read it to you. This is in the record of the Board.

"At this hearing, however, you have now heard the evidence given by persons working on the problem and seeing pictures which show beyond the possibility of a doubt -- any doubt -- that harm has been done at the Turkey Point location. It must also be accepted that if the temperatures of 1969 again exceed the biological limits, more damage will be done. Furthermore, with the increase in homes and with the increase in population, greater demands are going to be made for power over greater periods of time. This in turn will cause greater heat outflow from the Turkey Point plant over a longer period of time with the almost certainty of increased damage to the flora and fauna.

"If the thermal output were to remain in 1969 the same as in 1968, there will be some continuation of the changes that you have already seen. The barren areas are increasing, and there is some erosion, and more animal kills, etc. However, in 2 or 3 years it may not be a correctable situation, and then the Board can judge whether this amount of damage to the bay is permissible in the need for electric power, and the cost to the company to correct the situation.

"However, South Dade is growing. Its population is gaining in numbers and affluence. The first means housing, and the second means more heating and air conditioning. Undoubtedly, they are hard figures both for the county and Florida Power & Light as to the annual increase in population.

"We have already heard that 1968 was a bumper year and was a cause for violations now under discussion. If these conditions increase in 1969 and each succeeding year, you will see increased power demands. This will result in greater thermal pollution.

"Which is more important over a longer period of time? If the company does not develop a proficient cooling system the damage to South Biscayne Bay will become so widespread and such a magnitude and so flagrant that the complaints heard today will be nothing in comparison with the public outcry; and who will bear the burden of the complaints?"

When I said that last statement, the Pollution Board Chairman accused me of -- he wanted to know if I was going to lay the blame on him and to the Pollution Control Board. And I will say yes. I think that it does lie with the Pollution Control Board if they do not put this regulation in and enforce it, which is in the body of the Hoover Committee report.

This past year, 1969, I carried out investigations for the National Park Service, and an ecological study of the proposed Biscayne National Monument. That report is here and is with the Parks Service. We made aerial surveys and underwater surveys over the entire area of the Biscayne National Monument and of the adjacent waters in Card Sound.

We can see no major difference between these two areas in our study.

Dr. Gunter has said that things recover when damage is done. This is absolutely true. They do. But this is dependent -- and I'm sure that he will agree on the amount of damage -- the frequency with which damage occurs, the extent of the damage, and how much of a period it has in which to recover.

As the extent of the damage increases, as the period of time increases, it is becoming more and more difficult for things to recover in the shorter and shorter period that is left to them. This is what we are faced with here in problems of thermal pollution. This is why it is essential that something be done about it.

Now, in our study of the Biscayne National Monument, we came upon a phenomena which we could not explain from our study, but which I would like to report on here. That was from the south end of Elliott Key in a broad band as far as we covered the area moving on over to north of the Arsenicker Key, and on over to Turkey Point, we found increasing evidence of bottom damage starting clear over at Elliott Key.

I do not know the damage done at Elliott Key and the back side there, but it is certainly an interesting piece of coincidence perhaps that the damage to the bottom in rotten damage, defoliated Thalassia, the turtle grass, and the accompanying forms with it in increasing amounts. The filamentous algae that goes along with this situation, it has increased directly and proportionately as we approach Turkey Point; but this was far outside the range which has been indicated by any of the people who have surveyed it here.

Now, a question was raised as to perhaps my scientific qualifications, and I would like to just make a statement here. Col. Davis stated that the original proposal which went into AEC had my name, Dr. Idyll's and Dr. Smith's as principal investigators on this. I wrote the entire proposal on the thermal pollution study, chemical levels, etc. for this and departed for Europe.

Dr. Gilbert Voss

In my absence a section was added to this on fisheries, and the fishery section was in it. This was sent in before I returned from Europe. It was sent in to the AEC to Dr. John Wolf. The report came back from his people who reviewed this and stated that this was the best proposal that they had ever had for a study of this nature that had been sent in to them; that the people who were involved and were proposed were highly competent, and that all of the reviewers said they were certain that the work stated would be accomplished. It was turned down, but not from the innuendo or insinuation that Col. Davis made. It was turned down because they didn't have the money to support it. It came up to, as I recall, around $800,000 to make the study that we felt was necessary.

Because of this, and having to find various agencies to consider this (the FWPCA and others) and because we had an associate director who would handle things which were interdivisional in nature, this study was turned over to Dr. Bader who wrote the proposal, deleted parts that could not be supported by the various agencies, and the 2 proposals were then submitted, and they were granted.

Dr. Gilbert Voss

As I was principal investigator on this, I no longer was on the new one, and because I am a divisional chairman and am not concerned with the present operation, I was no longer included on it. I had no intention of carrying out the field work in the original one. I think this explains the situation of the discrepancy which Col. Davis had introduced.

The situation we see coming up in Card Sound is one which I would like to comment on. This is completely aside from all of these remarks regarding the Hoover report. Many opinions have been expressed as to what the situation might or might not be in Card Sound.

Dr. Gilbert Voss

From my own personal knowledge of the area, which I have known for about 30 years, I think that on the matter of the volume of water alone there is going to be extensive change in Card Sound. There can't help but be. It is going to help impede the change of water from outside the line of the Keys. It is going to prevent the flushing which usually occurs in the open water from the incoming current and so on, and we are going to have considerable changes within this area.

What the biological changes will be, I cannot predict, as I did successfully concerning the matter of increased thermal pollution in this past year; but I will predict if this goes through that you are going to have very considerable changes. It will not be the same Card Sound that we presently enjoy.

Now, in closing, I would like to say that I have never been against the Florida Power & Light. I enjoy their electricity. I use it every day, especially at night. What we are concerned with here is not just the present Turkey Point establishment. It is the future of all other establishments of this nature in South Florida, where we are concerned with the tropical environment entirely different. And this is why the Bechtel Corporation is having difficulties in this area, because they are dealing with a temperature situation that they probably have not encountered anywhere else, and the flushing problem that they have has not been encountered before.

I have repeately suggested from the Metro Commission, from the Pollution Control Board, from the Zoning Board and hearings starting with Seadade and on up to the present, that the Dade County and/or the State establish a long range plan concerning the environment, so that additional man-made improvements, buildings, development of the land, bulkheading, etc., all of the things which go on every day, and, if we have a plan, we will have less change in the environment. Anything that we do as human beings is going to change the environment somewhat.

What we have to do is when we change it is to do it with the least damage of what we have. I and every person who has worked in the environmental field in conservation and ecology are concerned that everybody is for conservation. They are all for the environment until it costs money, and then we get to the parting of the ways between the two groups.

It is going to cost money. The fact that we may have to change something that is already in effect surprises me that there should be objection to this because this is the only way we are going to save ourselves from the continued pollution, which is occurring not only here in Florida but all over the world.

We have to try to bring it back into some reasonable useful manner and not always say that we have got to go on because man needs it. I am not for the birds, the bees, the little tiny delicate animals in the water. I am for saving this for man. It happens that what is good for the organism in the water also happens to be good for man.

I thank you.

MR. STEIN: Thank you, Dr. Voss. Are there any comments or questions?

MR. REED: Dr. Voss, in the Hoover recommendation of a 90° temperature limitation, in your opinion, did that recommendation contain a safety factor?

DR. VOSS: No, sir, it did not. This is the thing we debated at some length. It is customary in industry to always have a safety factor. We wanted to have a safety factor in this. It was discussed at considerable length. If we put a safety factor in this, it would have been down. We didn't feel we could go any further than we were on this. So that there is no safety factor again.

I cannot agree that 92° or 95° can be permitted because this is the termperature at which adult organisms are found to be suffering, or the temperatures above this kill them. I can't agree with that. We know -- and there is no question about it -- that there are detrimental effects at 90°.

MR. STEIN: Are there any other comments?

I think that your report, Dr. Voss, as I understand it, agrees with what Dr. Tarzwell said and the Federal report. I think possibly it disagrees with the Dade County requirements and the program presently being engaged in by the industry. Some way we will have to make a judgment on these bases.

DR. VOSS: I have one comment that I would like to make, if I may.

MR. STEIN: All right.

DR. VOSS: Our report was finished up the end of February. About 2 weeks after we finished our report the Patuxent study report came out. This recommendation, I believe, was entered as Maryland State law that 90° cannot be exceeded in Maryland waters. It was done on the same basis that this is a level at which or above which there are death effects to the habitat.

MR. STEIN: It is not the law. The law has to be passed by the legislature. It may be a regulation.

By the way, you coincide with what they came up with in the Chesapeake in Maryland. I think it coincides with the National Technical Advisory Committee. You are pretty close. In other words, the reports are not incompatible. The Patuxent report and the conclusions of the Federal investigators are compatible with each other.

I view the proposals of the Florida Power & Light and the experts put on by the Florida Power & Light as having views which would modify these conclusions somewhat, and I think that this is obviously the determination that the conferees are going to have to consider.

DR. VOSS: There have been some rather astounding statements made here concerning the matter that the water can go through the cooling system without damaging things. I have the Mihursky report here of the Patuxent Power Service on phytoplankton samples taken at intake, and samples taken at the discharge station which showed 94 percent reduction of photosynthesis of phytoplankton passing through the condensers. Up to 100 percent the copepods were killed. The figures are here, and they were careful studies that were carried out, and I see no comparison whatsoever with what was said before.

MR. STEIN: I think that Dr. Marshall has been lured away by one of your richer universities. He has come to about the same conlcusions that you indicate there -- that there is extensive damage. But I think that this is the job the conferees are going to try to work our way through. I believe that it is a question of philosophy that we are going to have to apply. The notion is: are we going to try this? Is it going to work? Are we going to protect it? Are we going to be sure that it works?

Thank you, sir.

Can we come back at a quarter after two and stand in recess until then?

(Whereupon the Conference recessed until 2:15 p.m.)

AFTERNOON SESSION

Dr. Donald P. DeSylva

MR. STEIN: Let's reconvene, Mr. Reed.

MR. REED: Mr. Chairman, I have so many cards of people who wish to speak, I have put them in some type of order so that those who have been here the longest get a chance to speak first.

I will call on Dr. Donald DeSylva of the Institute of Marine Sciences.

DR. DONALD P. DeSYLVA,
ASSOCIATE PROFESSOR OF MARINE SCIENCE,
UNIVERSITY OF MIAMI,
MIAMI, FLORIDA

DR. DeSYLVA: Thank you, Mr. Reed, and members. My name is Dr. Donald DeSylva. I am Associate Professor at the Marine Sciences at the University of Miami. I wish to make two brief comments:

1. Some information which may not be available to you. My graduate students and myself are working on an FWPCA grant on the ecology distribution survival of larval fishes in Biscayne Bay. We also have some stations in Card Sound. We haven't been working on

this long enough but we will be sure that you gentlemen will receive reports on this as soon as it comes out.

I do have some information pertinent to Dr. Lackey's comments this morning. We have done some laboratory experiments, and these are currently being continued and expanded, and we have no published data at this point. However, concerning the effective temperature on early stages of fishes, we find that larval fishes, tropical larval fishes typical of lower Biscayne Bay -- this includes commercial, sports species -- become in trouble at 88°. At 90° they begin to show irreversible changes. By 92° they are dead. At 90° we find arrested development in fish eggs, and some mortality; some changes in the embryonic development, and at 92°, between 92° and 93°, the elevation of 1° will cause the eggs to explode.

Another point I would like to make, if you will bear with me for a moment: About 10 years ago, I spent some time working on the life history of the barracuda. This seems irrelevant, but if you will bear me out we have in the tropics a rather peculiar situation and which I don't think has ever come up before in tropical plants. I have talked about this briefly before, but we have a problem in tropical waters or in the tropics called Sigillaria. This is a strange, little known effect which evidently starts in tropical waters with the production of bluegreen algae. The algae is fed upon by certain fishes, and these fishes in turn are eaten by barracuda, snapper, grouper, kingfish, and a number of other forms.

Now, again we don't know exactly what the causes are or why this evolved in history, but we do know it is a very dangerous type of poison. There is no way to check which fishes are toxic. All we do know, if you eat them and you become sick, you've got it. It is very strange. It has nothing to do with the freshness of the fish, but we do know it is common about coral reefs and adjacent areas.

Now, one of the problems which has happened already, which we were wondering about, was off Turkey Point, as far as we know before the present discharge, was inhabited by green algae, small forms, macroalgae and microscopic algae. By and large there are only a few green algae which cause toxicants in fishes. These, to our knowledge, did not occur in Biscayne Bay. If they did they were rare.

Dr. Donald P. DeSylva

We do know, on Page 31 of Mr. Purkerson's report, FWPCA data, according to his observations and what we have seen in our plankton samples, some of this bluegreen algae and some of the poison green algae are starting to appear. Nothing has happened yet, but I think it is fairly safe to say that if this continues we have a long-range problem. Now, whether or not the organisms appear presently in the area, we can't say.

Some of you gentlemen have asked before what would be some of the biological effects of increased flow which would be going through Card Sound. We do know that there is a counter-current off Broad and Angelfish Creeks. This is a periodic thing, but just to the south of Angelfish Creek where some of this discharge water would go, according to the testimony, there would be increased flow from Card Sound into the offshore areas.

Now, of the water which has been enriched by the bodies of decomposed organisms passing through the powerplant, or even the fertilizers which are breakdown products of detergents, biocides or anything used in the normal operation of any plant, these would cause just conditions that we need for the introduction of a toxicant algae -- a bluegreen algae.

Dr. Donald P. DeSylva

These waters could cause in the area of Card Sound this Sigillaria cycle to start, or it could carry it to the reefs of Pennecamp Coral Reef. We do know that this is an ideal area for the Sigillaria toxin change of events to begin. We know we have it in Florida occasionally, and it is quite a problem.

Now, the consequences of this, gentlemen, are not that a few people would get sick, but there are several tropical areas throughout the world -- Virgin Islands, the Marshall Islands, the Marianas -- in which fish are not eaten because the natives do not know how to tell the dangerous ones from the non-dangerous ones. As a result the seafood market has been hurt. There is a protein shortage, and I predict that should something like this happen to any great extent, again, we -- we can't predict the incidence of it, but if it does occur, the market for Florida fish, which is already in danger, could be seriously jeopardized because of a few incidental cases of fish poisoning caused by such a remote thing as a change in the current and chemical composition of the water from the powerplant.

Thank you.

MR. STEIN: What are the symptoms?

DR. DeSYLVA: They are rather strange. The way we first noticed it, we were sitting in a bar one day, and a girl was there. She had a mug of cold beer in her hand, and a towel wrapped around it. As she was blowing to cool it, what happened she had a complete reversal of sensation. Things which were hot felt cold; and things which were cold felt hot, and this goes on to a case of itching, and sometimes your hair and fingernails fall out. Your bones start to ache, and it is only fatal in about 10 percent of the cases. Some species are more taxic than others, but there is no remedy for it.

MR. REED: Dr. DeSylva, on the 88° stress, 90° changes, 92° dead, this seems to certainly enter the controversial picture again because these micro-organisms that have been seen by a number of people who testified this morning and yesterday, coming through the cooling system, have not exhibited these changes or stress symptoms. That was quoted to us. It is very difficult to analyze stress or change in micro-organisms.

DR. DeSYLVA: Well, the animals I am working with are larval fish from about 1/8 of an inch to 1/6 of an inch. They are the most sensitive forms.

MR. REED: This was in larval fishes?

DR. DeSYLVA: These are larval fishes only. I can't speak for the other groups. I do know Dr. Thor-Haug has found that our temperature change of between 89° and 91° in the laboratory experiments has shown that shrimp will not molt through the next day so effectively; they are killed between a change of 89° and 91°.

MR. REED: Were you a participant in the Hoover report?

DR. DeSYLVA: Yes, I was.

MR. REED: And you concurred with the 90°?

DR. DeSYLVA: Yes, I do. I want to add that the FWPCA report, a report by my colleagues, and additional research which I have done since merely confirms my original conclusions and in concurring with the other members of the Hoover report.

MR. STEIN: Do you think that the proposal that you have heard of the Florida Power & Light in Dade County is consistent with the recommendations of your report?

DR. DeSYLVA: No, sir, it is not. In my opinion, I believe that 95° perhaps at one time was probably a reasonable guess in some waters, but I think that at 92°, between 90° and 92°, there are irreversible biological, physical and chemical changes. We are talking about whether life exists or does not exist, and I believe that 90° is the limit which we have come upon.

MR. STEIN: Any comments? Any questions? Thank you very much.

MR. REED: Mr. Chairman, in introducing the next person that wants to testify, I want to identify her as one of the better known citizens of Dade County, one of the most distinguished lawyers in this county, a great personal friend of mine and my family. I have not discussed the case with her, but it is with great pleasure I introduce Mrs. John Wainwright, the President of the Tropical Audubon Society.

MRS. JOHN WAINWRIGHT, PRESIDENT,
TROPICAL AUDUBON SOCIETY,
MIAMI, FLORIDA

Mrs. John Wainwright

MRS. WAINWRIGHT: Mr. Chairman, Mr. Reed, and other conferees. Mr. Reed, may I thank you for your very gracious remarks. It is true, as a good administrator, you have not discussed this matter with me.

We welcome the opportunity of appearing before you today and participating in this landmark conference. Inasmuch as I represent a group of conservationists who are laymen, my remarks will be more or less confined to the generalities of the situation with respect to the protection of Biscayne Bay and Card Sound.

I think it would be helpful to review very briefly the part that the Tropical Audubon Society has played in this matter for several years. Tropical Audubon Society -- which incidentally is one of the largest conservationist organizations in South Florida -- has for several years been concerned over the biological problems that have been caused by the excessive heat load discharged in the Biscayne Bay from the Turkey Point powerplant.

In 1967 and in 1968, representatives of our organization appeared before Metropolitan Dade County Commission and other governmental bodies in opposition to the permits and the variances that were granted for the first canal at Turkey Point, as it was believed by the members of our Board that adequate protection was not provided by Florida Power & Light Company for the protection of the marine environment.

Such opposition was based upon the considered conclusion of the group of scientists serving on our board of directors, as well as the opinions of marine scientists who were consulted, and data forwarded by the Federal Water Pollution Control Administration.

In the summer of 1968, Dr. Oscar Owre of the Department of Biology, University of Miami, and past president of Tropical Audubon Society, conferred with Dr. Malon Kelly, then with ESSA, in respect to the effects of the discharge of the heat load from the canal at Turkey Point plant.

Parenthetically, I say that Dr. Kelly happened to be at the University in connection with an entirely different study.

There were photographs taken by Dr. Owre in November of 1968, which revealed that damage indeed had occurred to the bay. This evidence is now supported by the report on Thermal Pollution of Intrastate Waters prepared by the Federal Water Pollution Control Administration dated February 1970, which has been introduced into evidence before your group yesterday.

Conclusion A, No. 1 states: "Severe damage has occurred to the aquatic plant and animal population of Lower Biscayne Bay due to the present heated effluent from the Turkey Point plant of the Florida Power & Light Company."

Subparagraph 5 of the Conclusions states: "The biological degradation zone covers about 670 acres of Lower Biscayne Bay as observed during the summer of 1969."

Subparagraph 6 of the Conclusions reads: "A wide variety of both aquatic plants and animals were killed in late June 1969. This damage to aquatic life and vegetation is directly attributable to the discharge of heated effluent from the Turkey Point facility of Florida Power & Light Company."

I have read that into the record because those conclusions sustain the pictorial evidence obtained by Dr. Owre when he took photographs in November of 1968. Dr. Owre is a professor at the University of Miami, and unfortunately his teaching schedule did not allow his appearance before you today.

Mrs. John Wainwright

The National Audubon Society and the Tropical Audubon Society are vitally concerned over the preservation of our natural environment. Not just for wildlife but for man himself. The quality of life has become increasingly important to all of us. In South Florida we have witnessed the misuse and the poorly planned development of most of our land areas.

We are reminded of a comment by Wesley Marks in the Audubon Magazine as follows: "The conquest of the land gives me a high standard of living and a cheapened environment in which to enjoy it."

Cheapened environment. That is what we don't want to see happen to Biscayne Bay. It is the only natural resource of any quality that we have left in Dade County. We cannot afford to gamble with the protection of this priceless asset. Its value for recreational uses cannot be measured. Sailing, boating and game fishing in Biscayne Bay attract not only residents but thousands of tourists annually.

Commercial fishing in the bay yields fish and shellfish valued at approximately $3/4 million a year.

Mrs. John Wainwright

We know that the report of the Federal Water Pollution Control Administration comments on the high quality of water in Lower Biscayne Bay, including the Card Sound area, the water having been found to be free from the usual pollution found in similar bodies of water.

This factor focuses particular attention upon the effect of changing this high quality water by discharging excessively heated water from Grand Canal and Turkey Point at the mouth of the proposed canal into this body of water, or these bodies of water, Card Sound and Biscayne Bay respectively.

We are also concerned at the sheer volume of water that will be discharged from the proposed canal, and the inevitable changes in currents that will result thereby will undoubtedly have an adverse effect upon the ecology of the Card Sound region.

We noted with interest that Mr. Lee Purkerson, of the United States Department of the Interior, testified yesterday that any significant change in water circulation patterns generally leads to change in marine life. Dr. Tarzwell discussed this point in his able testimony yesterday, and Dr. Voss just mentioned it this morning.

We understand the need for increased electric power in South Florida. We maintain, however, that the powerplant facilities to serve our area must be constructed, managed and controlled in such a way as to preserve the biological integrity of Biscayne Bay and Card Sound.

Obviously this is the problem of the conference. Specifically we have not heard during this conference sufficient evidence that the proposed canal at Turkey Point will bring about a lowering of the temperature of the water to be discharged to meet the standards recommended by the Federal Water Pollution Control Administration whose findings we place a great deal of confidence in.

In addition to the difficult problem of temperature criteria that will have to be decided by the conferees, we urge that superviosry procedures will be established to insure compliance under appropriate governmental control.

Returning to the record of the Federal Water Pollution Control Administration, Tropical Audubon endorses the recommendation in respect to the necessity for abating the excessive heat load now being discharged into Biscayne Bay from the Turkey Point canal -- the Grand Canal. We also endorse the recommendation that a temperature monitoring program be established to insure compliance with established temperature standards under the supervision of appropriate governmental bodies.

In conclusion, may I say this statement and the position of Tropical Audubon Society are supported by the National Audubon Society.

Thank you, gentlemen.

MR. STEIN: Thank you, Mrs. Wainwright, for a very eloquent statement. Are there any comments or questions? If not, thank you very much.

MR. REED: Next, Mr. Chairman, I would like to call on a distinguished member of the legislature. Representative Gerald A. Lewis, Attorney.

GERALD A. LEWIS, ATTORNEY,
LEWIS & RENO, MIAMI, FLORIDA

MR. LEWIS: Mr. Chairman, and conferees, my name is Gerald Lewis. I am an attorney in the firm of

Lewis & Reno who represent Mr. James F. Redford, Jr., Mr. G. A. Ellis, and the Mangrove and Keys Chapters of the Izaak Walton League of America.

Florida Power & Light Company and Mr. Paul Leach, the Dade County Pollution Control officer, have justified at length the hearings before the Dade County Pollution Control Hearing Board. The fact of the matter is that those hearings were nothing more than a sham. As an attorney, I say that advisedly. I say it reluctantly. We represented Mr. Redford and the Izaak Walton League in the appeal before that Board.

We believe that there has been a total denial of due process of law throughout the procedures at the county level. We are also prepared to show that the Dade County Pollution Control officer and the Dade County Pollution Control Hearing Board committed at least two violations of Florida "Government in the Sunshine" law. (Sec. 286.011, Florida Statutes.)

Mr. Leach issued his "Authority to Construct" the cooling canal in a letter dated December 5, 1969. This authority was granted without a hearing, contrary to what you have heard. It was granted apparently on the basis of Florida Power & Light Company's application, and its statements alone. The public was not given an opportunity to be heard, to present evidence, or to cross examine witnesses.

The testimony that you have heard as to previous hearings related to hearings dealing with Florida Power & Light's application for a variance and not with "Authority to Construct."

In arriving at his decision, Mr. Leach apparently instituted no independent investigation of the damage that would be caused by this system. His staff is a limited one. It does not have a marine biologist. I don't think he has a boat.

Mr. Leach, by the way, has not accurately represented the standard for thermal pollution under the Code of Metropolitan Dade County. Yesterday he told you that the standard was 95°.

I might add that numerous other people have talked about 95°. At least two witnesses from Florida Power & Light talked about 95°. Gentlemen, that is not the sole standard of Metropolitan Dade County Code, and I think we ought to get that clear once and for all.

During the hearings before the Dade County Pollution Control Hearing Board, the Assistant County Attorney continually advised Mr. Leach and the Pollution Control Hearing Board that the County Code is violated by discharging water in excess of 95°, or by "discharging water at a lower temperature ..." I'm quoting. " ... if it is injurious to human, plant, animal, fish and aquatic life ..." Mr. Leach has recognized this standard in the printed statement that I have given you.

I make reference to the transcript before that Board. I assume if you wanted it the Board will make available the transcript to you. Mr. Leach has recognized that standard; yet he appeared before you and said the standard was 95°. We are at a complete loss to understand why Mr. Leach continues to make that false statement.

In any event, we appealed Mr. Leach's decision to the Dade County Pollution Control Hearing Board. The Code of Metropolitan Dade County provides for a hearing de novo on appeal, and this was our first opportunity for a so-called "public hearing" on Florida Power & Light Company's application to construct the cooling canal. As we stated before, the hearings prior to that time related to the request for a variance.

Gerald A. Lewis

From the outset, we were denied a full right of appeal. Mr. Leach, whose decision was being appealed, sat with the Board as an ex officio member of the Board. We entered our objection. I objected to the fact that he gave advice to the Board; that he questioned witnesses; that he presented conclusions to the Board. It was admitted by the Board and by the Assistant County Attorney that Mr. Leach was "a technical consultant and advisor to the Board."

At the first hearing, on January 14, 1970, we asked that Florida Power & Light not begin construction of the canal, at least until the recommendations of this conference were available. Florida Power & Light refused.

We filed a motion with the Pollution Control Hearing Board of Dade County. We virtually pleaded with that Board to exercise its discretionary power to issue an order staying commencement of construction until the recommendations of this conference were available. Mr. John White of the Southeast Regional Office of the Federal Water Pollution Control Administration advised the Board that it "would certainly be beneficial if you issued a stay now ..."

Gerald A. Lewis

Remember, we were asking for a delay of only a few weeks, gentlemen. Incidentally, the County Board and its legal advisor, the Assistant County Attorney, made very clear from their remarks that they were unaware of the existence of the Federal Water Pollution Control Act, let alone its provisions.

The Dade County Pollution Control Hearing Board refused to issue a stay order.

We appeared before the Dade County Commission and requested that they take action to stay construction of the canal. They concluded that they did not have the power to do this, but in an open meeting one of our County Commissioners asked Florida Power & Light Company if it would voluntarily delay commencement of construction. Again, the Power Company refused.

Our argument then, as it is so often, that we know what will happen a couple of years from now when we find out that there is damage and there is destruction, and we ask them for it to be abated, the argument that's always raised, "But we have invested $10 million or $20 million. Look what you're doing; we'll have to cut off the power." So we have gone on record now at least on those occasions asking that they stop before it is too late.

Gerald A. Lewis

At the hearing before the County Pollution Control Hearing Board, we presented testimony showing that damage would occur to plants, fish and other aquatic life at temperatures in excess of 90°. You have heard much of this here. Dr. Voss was one of our witnesses. Mr. Leach advised the Board to ignore this evidence by simply concluding that there was no evidence of such damage. This was hisargument to the Board. Again, by so advising the Board, that meant he ignored completely the testimony of such men as Dr. Voss. Mr. Leach completely ignored the record, which speaks for itself.

Both Mr. Leach and Col. Davis of Florida Power & Light Company have extolled the virtues of the Dade County Pollution Control Hearing Board, and have told you that the Board is well qualified to deal with the complicated questions of thermal pollution. They went into detail that the five members were experts. However, the closing remarks of the Chairman of the county board may convey to you the frustration that we have felt throughout the proceedings at the county level.

Gerald A. Lewis

I will not read all of the quote that is on this sheet, but just one brief part. After first explaining that the Board was in a difficult position because there was evidence on both sides, he said:

"The Board regrets being put in the position of trying to decide technical questions when you have two groups of marine biologists, two groups of engineers, and so forth. We are not capable of doing that ..."

He then concluded since there was evidence on both sides he would just let the matter stay. The Dade County Pollution Control Hearing Board entered a final order, basically affirming Mr. Leach and approving the cooling canal. It is now apparent that that order had been agreed upon prior to the final hearing on February 19, 1970, thereby denying us due process.

The Assistant County Attorney has told us that he and Mr. Leach drafted the Board's order, based on what they thought the Board would conclude, and they presented the order to the Board prior to the final hearing and prior to our final arguments. The order had obviously been prepared with the knowledge and direction of the Board prior to final arguments or merits. One of the Board members left little doubt that the order had been agreed upon before the hearing when he said, prior to any discussion, " ... this is one of the reasons the order has been prepared as it is ..."

The Assistant County Attorney, in closed session with Mr. Leach, prior to hearing legal argument, decided that Mr. Leach's decision was presumed to be correct and that we had the burden of proof to prove Mr. Leach wrong. This was decided prior to our submission of a memorandum of law and prior to our argument on the point.

Yet, as we have pointed out, Mr. Leach's decision was based solely on statements presented by Florida Power & Light Company. The public never had an opportunity to be heard, except when the burden of proof was against us. The Cahirman of the Pollution Control Hearing Board summed up the futility of our efforts before that board when we attempted to argue that Florida Power & Light Company should have the burden of proving that the canal would comply with the code.

He said: "I'm afraid I don't follow you, Mr. Lewis. You are the ones who are seeking something; not Florida Power & Light ..." He meant that we were seeking a reversal of Mr. Leach's order. He continues: "Florida Power & Light is asking for nothing except that we do nothing ..." He then added: "Our position is that you and the attorney are discussing something that we don't know anything about."

Yet I repeat, the conclusion of law contained in that order, which was prepared prior to that time had already been decided, and the Board never considered it, nor was any ruling of law made at the hearing. So the only conclusion, the inescapable conclusion is that it was decided prior to that public hearing.

The Board voted unanimously to affirm Mr. Leach's approval of the cooling canal, with some modifications as to studies and monitors, but not as to the canal. Yet, at least two members of the Board had previously stated that damage would occur at a temperature of 92°. I have given you the citation of the transcript to indicate when these two Board members did say that. We would like to point out -- and I won't go into the evidence because you have heard that here as to damage that occurs lower than 95° -- but let me point out some of the assumptions and contradistinctions upon which Florida Power & Light bases its statements concerning the efficiency of the canal, which I repeat is not the standard.

Dr. Coughlin of Florida Power & Light stated before the Board that:

" ... we would be derelict and irresponsible to put in any kind of system that was not a proven factor ... "

We submit that on the basis of its own testimony Florida Power & Light is being derelict and irresponsible, for the company admits that it relies only on assumptions. These assumptions have not been proven. The company cannot prove the system will work.

Florida Power & Light assumes that starting with a certain ambient intake temperature there will be a certain temperature rise across the condensers; 150 percent dilution will then occur which will reduce the water to a certain temperature above the initial ambient intake temperature, and there may then be a temperature loss as the water goes down the canal.

Gerald A. Lewis

The inadequacy of the proposed system is revealed in the contradictory opinions of Florida Power & Light's own witnesses as to what these various temperatures would be.

Let me take you through their testimony as briefly as I can. As to the ambient temperature, Dr. Coughlin has measured ambients of 88° but assumes an ambient of 89°. Dr. Dean, a witness for Florida Power & Light, admitted that the ambient will sometimes exceed 90°. Col. Davis of Florida Power & Light, described ambients of 89°, 90° and the highest ever recorded of 92°.

Now, let's consider the temperature across the condenser. All witnesses agreed that it would go at least as high as 15°. However, even the figure of 15° is an assumption, and cannot be supported by technical data.

I referred to the page of the transcript where questions were raised, and there just wasn't any doubt as to that temperature rise.

Now we talk about a decrease upon 150 percent dilution. Florida Power & Light witnesses all assumed that dilution would decrease the water temperature to 6° above the initial ambient.

Gerald A. Lewis

Cooling in the canal: Initially, Dr. Coughlin assumed there would be no heat loss in the canal. Then he said they had measured heat losses of 3° in present canals, while at the same time admitting that the heat loss would vary according to atmospheric conditions. Dr. Dean testified that the heat loss in the canal would be less than 1 °.

We added these up, using the company's own figures. Of course, we took the figures that they had. We take an initial ambient of 92° and increase it 15°, and then we decrease it 6° above the initial ambient and get 98°, less cooling effect in the canal of 1°, we get 97° at the discharge point.

Now, counsel for Florida Power & Light at the hearing accuses us of playing a numbers game. It is their numbers, and that is not a game. These are the problems we are faced with.

When asked what would happen if the discharge temperature exceeded 95°, Florida Power & Light said it did not know. It had no supplemental means to solve the problem other than the canal as planned.

They have not presented to you here any supplemental means other than to say, "We will do it."

They have glibly promised the temperature at the discharge point would never exceed 95°. They have also promised that if there was any degradation of the waters of Biscayne Bay due to warm water being discharged into it, the company would take action to correct it. Yet, the company cannot even say how it would insure temperatures of 95°, much less temperatures that would prevent damage.

We constantly got the argument, "We have to because that's the law " I don't mean to be facetious, but if that's all we are talking about, all you need is a man with a thermometer to go out and take the temperature, and if it is over 95° you take them into court. I think that is what someone from Florida Power & Light said.

We are trying to save something and prevent the damage. Based on the testimony of Florida Power & Light Company's own witnesses, the discharge into Card Sound can exceed 95° if the proposed canal is used.

Nonetheless, the Dade County Pollution Control Hearing Board ignored its own statement and the evidence, and ruled as prescribed by Mr. Leach in favor of Florida Power & Light.

In short, the people have never had a fair hearing. We thank you for giving us the opportunity today.

MR. STEIN: Thank you, Mr. Lewis. After listening to your statement, I want the record to show that I never met Mr. Lewis before. You must have gone through the same law school, because, without the conclusions, I think we have identified the same problems. These are the questions in large measure that I have been asking throughout this conference.

Are there any comments or questions?

MR. THOMAN: Just a question. The Dade County Pollution Hearing Control Board denied your appeal on February 19, 1970?

MR. LEWIS: Yes, sir.

MR. THOMAN: When did they take the testimony on your appeal?

MR. LEWIS: Testimony began on January 14. I believe there were four hearings.

MR. THOMAN: Am I correct that our data, our figures are correct that Florida Power & Light Company started digging the canal on February 7, 1970 without even having the appeal denied or affirmed?

MR. LEWIS: I believe that that is when they started, yes.

MR. THOMAN: Thank you very much, Mr. Lewis.

MR. STEIN: Mr. Reed.

MR. REED: Next is Mr. James Redford, President of the Mangrove Chapter of the Izaak Walton League.

MR. REDFORD: I am wearing two hats, you might say. I have been asked as the vice chairman of the Hoover Environmental Legal Defense Fund to read a letter to this Board at this hearing, I should say, from Mr. Hoover who unfortunately could not attend today. I will read this as it was submitted to me.

HERBERT W. HOOVER, JR., CHAIRMAN,
HOOVER ENVIRONMENTAL LEGAL DEFENSE FUND,
BAL HARBOUR, FLORIDA
(Read by James E. Redford, Jr.)

Gentlemen:

I, Herbert W. Hoover, Jr., am an industrialist, a conservationist and Chairman of the Hoover Environmental Legal Defense Fund ... an organization dedicated to the preservation of man's environment for man's use, now and for future generations.

Being a conservationist, I am responsible for, as Col. Davis of Florida Power & Light Company put it yesterday, the "so-called" Hoover Report, although, to my wonder, I cannot understand his verbiage unless it is an attempt by innuendo to discredit the report by the implication "so-called." This is an old, yellow journalism twist that evidently is still with us.

The Report of the Committee on Inshore and Estuarine Pollution was compiled in February 1969 and printed in March 1969. The recommendations found therein are the known facts of the effects of thermal pollution on the aquatic life of Biscayne Bay and South Florida.

The nine scientists and one engineer that compiled this information were chosen on the basis of their previous research and working specialities in the field of the marine sciences. They met in private in order to avoid any political and/or other pressures that could have affected the end result of this report.

It is interesting to note that shortly after the Report of the Committee on Inshore and Estuarine Pollution was made public, subsequent reports on/or about thermal pollution were published that paralleled this committee's report in its recommendations. I refer specifically to the Patuxent River Valley Report, or, as it is commonly known, the Mihursky Report, and the paper by Clark in the Scientific American Magazine.

To my knowledge, these reports were compiled without any communication with our committee.

Col. Davis' statement that this report was a pointed attack on Florida Power & Light Company, devoid of scientific objectivity, is untrue. The report deals strictly with the tropical waters of South Florida and is supported by an extensive bibliography.

I understand from a State Representative that Col. Davis personally lobbied against the two bills containing the recommendations of the report of which he spoke yesterday, that were introduced in the Florida Legislature in 1969.

In quoting Dr. F. Walton Smith, Director of the Institute of Marine Sciences, Col. Davis failed to mention that he, Dr. Smith, is one of the best known and most respected administrators in the world in the marine sciences; however, Dr. Smith is not an ecologist. Further, it is my understanding that Dr. Smith has not done any scientific work for more than 10 years in the area of the report. By no means is this statement an attack on Dr. Smith, who has contributed so much to the development of the marine sciences. I merely point this out to show that Dr. Smith is unqualified to comment on the report's recommendations. Neither I, nor any of my associates, have, at any time, implied that this report was made by the Institute of Marine Sciences.

The Report of the Committee on Inshore and Estuarine Pollution has been circulated throughout these United States. Its purpose was to arrive at expert recommendations for a safe, understandable and enforceable thermal pollution standard for South Florida. There was a conservation void on thermal effects in South Florida, and my colleagues and I attempted to fill this void by sponsoring this report. Man's environment is in grave danger, a fact of which we are all aware. We of the Hoover Environmental Legal Defense Fund are working to alleviate some of these dangers, and thereby insure the birthright of Americans, to utilize this country's natural resources for now and generations to come.

I have not now, nor have I ever had, a personal vandetta against Florida Power & Light Company. I receive no monetary gain by working for conservation, nor do I want or expect any.

The decision for the protection of South Florida's estuary is yours. This important natural resource must be preserved.

I thank you.

/s/ Herbert W. Hoover, Jr.,
Chairman
Hoover Environmental Legal
Defense Fund.

MR. REDFORD: I don't imagine there will be any questions. It was delivered to me, and I haven't had a chance to talk to him.

I'll just continue with my statement, if I may.

MR. STEIN: Sure thing.

JAMES F. REDFORD, JR., PRESIDENT,
MANGROVE CHAPTER, IZAAK WALTON LEAGUE,
MIAMI, FLORIDA

MR. REDFORD: I want to point out the intent and content of my statement is largely to sort of take you into that other section of wonderland or through the looking glass country that Mr. Lewis has described to you. It is largely described, what we have gone through in the past 2 years to try to achieve some solution of this problem.

This conference, I hope, will be the culmination of a long battle by Dade County conservationists. Since science is well represented here today, I will confine my remarks to revealing some of the conservation footwork of the past 2 years.

Public opinion literally drove Florida Power & Light from their old Cutler plant. Battles with their neighbors over raw sewage dumped by the plant into the bay and excessive smoke and noise set public opinion against them. They responded by trying to buy up all the neighbor's property.

But then they discovered Turkey Point.

I will charitably assume the Florida Power & Light was not thinking of nuclear generating plants when they purchased Turkey Point, because just as soon as they turned on oil-fired generators No. 1 and No. 2, their error of choice was apparent -- rivaled, I'd say, only by the Dade County Port Authority's choice of a jetport site.

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But among the many things about Florida Power & Light's choice of Turkey Point, which are hard to understand, are the following two points:

1. They read the tide tables wrong and apparently refused to be corrected by either the Bureau of Sport Fishing and Wildlife or the United States Geological Survey.

2. Bechtel Corporation certified the present cooling system as adequate for all 4 generating units. When the second oil fired generator was turned on only 25 percent of the projected cooling water was coming out from the canal. Yet, they immediately began to have recirculation problems which is probably why we are here today. May I also point out that the former Commissioner of the U.S. Fish and Wildlife Service warned them well in advance that hot water would only travel 6/10 a mile away from Turkey Point during a tide.

The gentleman appeared from Bechtel this morning, and appeared at one of our many hearings, and I asked him why Bechtel didn't have a cooling system that was adequate at that time, and he said he wasn't working for the company at that time.

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Florida Power & Light is not the only villain. The AEC -- repeating aqua non mea culpa like some broken record -- certified not only the present unworkable cooling system but apparently has endorsed the latest Mickey Mouse creation of Bechtel, Florida Power & Light, et al.

Not only this, but the AEC refuses to discuss whether an inadequate cooling system constitutes a danger to the public whom they piously claim to be solely concerned with. I know this because I put the question to the AEC joint House and Senate Committee this month in Washington. I got words but no answer.

Fora year after AEC granted the license, we heard rumors from the North that there was such a thing as thermal pollution, particularly from Maryland. Then Florida Power & Light applied to the County Commission to dig its first "Thermal" or "Grand Canal" into the bay. We objected and were twitted and ridiculed all the way to the State Cabinet. Florida Power & Light won every skirmish up to but not including that before the Army Corps of Engineers, and may I offer my thanks to the FWPCA for help in that quarter. The canal was stopped at the water's edge, which has probably curtailed a good deal of damage.

At the State level, Florida Power & Light was granted a variance to what was then the standard, 93°F.

Then it really began.

In late fall, 1968, the Dade County Pollution officer filed a "Notice of Violation" on Florida Power & Light. They had allegedly discharged cooling water hotter than 95°F, the Dade County maximum.

Now, according to our Dade County laws (advertised by their drafters as the best in the country), you can get a variance after the violation which, practically speaking, serves to innoculate against penalties not only in the future but for violations in the past as well. So, logically, Florida Power & Light applied for a 6-month variance in order to come up with a better cooling system.

At that time we had a 9-man Dade County Pollution Control Hearing Board who were publicly feuding with the Pollution Control officer. At the first hearing, a half hour was spent in disqualifying a reluctant member of the Board. It took a while to convince him that being

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the chief supplier of fuel oil to Florida Power & Light constituted a conflict of interest in this matter. Another member was disqualified for being a stockholder in Florida Power & Light.

Shortly after this was settled, the Assistant County Attorney was told by the chairman of the board to shut up or be forcibly removed. He did so, and the board began its hearing unimpaired by legal niceties.

Subpoenas were issued to many witnesses for the second hearing. The chairman --

MR. STEIN: By the way, what did he do? Was he ejected, or did he shut up?

MR. REDFORD: He shut up.

The chairman opened the meeting with a harangue on freedom of the press after a line by line analysis of each and every news clip and editorial that had been printed up to that time about the hearings. Then he claimed that the subpoenas were illegal since they had been signed by one of the Pollution Control officer's assistants instead of by a legal authority. He was correct, and he offered all the witnesses a chance to go home. They stayed.

Then he brought up that the meeting had

not been properly advertised, and the board went home, so the rest of us had to follow.

At the next meeting we had proper subpoenas, apparently, and having discovered the subpoena, the chairman issued a lot of his own. It seemed the chairman had given a speech to an engineering class at the University of Miami. The speech was tape recorded. Allegedly, the chairman got carried away and questioned the biological category into which the parents of one of our paper's editorial writers should fall. The tape, as his story went, got into the hands of the Pollution Control officer who subsequently played it at selective stag gatherings.

So, answering subpoenas were the entire engineering class in question and its professor. Not much came out of this except another hour long lecture, this time on academic freedom.

Many did not answer the chairman's subpoenas, and it looked grim indeed for them until the Assistant County Attorney -- he was speaking now -- pointed out that, for some recondite legal reason, these subpoenas were also illegal.

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I don't remember much else of what happened, except that the Pollution Control Officer was sworn in. He was asked his academic qualifications. Allegedly, according to the chairman, they turned out to be exaggerated. In any case, the whole business ended up in a barbecue at Turkey Point with Florida Power & Light board chairman as host. I believe it was there that the chairman fed us the now famous line, "Hot water never hurt anybody." "Man and boy," he said, "has been taking a bath and cup of coffee all his life, and he was the better for it today;" and I agree.

We then filed the Hoover Report on thermal pollution, appealed the variance to our County Commission, and lost. Meanwhile the Pollution Control officer resigned when the newspapers reported that he had been exaggerating his college degrees under oath. And, incidentally, the entire 9-man board was fired, also.

This was about a year ago. The Pollution Control officer is still with us, and probably will be until the county manager hires a new one. This will take some time.

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Shortly afterward, we got a new 5-man Dade County Pollution Control Board which resumed the hearings when Florida Power & Light variance experience. We also got a new Assistant County Attorney. I have often wondered where the first one went.

The qualifications of the board I'd like to dwell on for just a moment. Part of the Hoover Report, the part which is not discussed here today with recommendations for the type of board, the way the board should operate, the recommendations were not taken, and as a result there is not one single marine biologist on the board. There are biologists, and I assume that they are quite qualified in their field.

The new board met to consider a new cooling plan for the powerplant. I shan't describe it except to say it is a cooling canal from Biscayne Bay to Card Sound. We opposed it. So did a number of prominent scientists and engineers who came on their own time to give evidence before the board.

It took four meetings to hear all the evidence on this canal. At the end of the fourth meeting, the board asked the Assistant County Attorney what form its ruling should take; and he, in effect said "no form at all," because he ruled that cooling canal design was the sole province of the Pollution Control officer. And if you will pardon the blasphemy, there was another four meetings shot to hell.

A few weeks later the Pollution Control officer ruled. He authorized the canal. Apparently he based his decision on the expertise of Florida Power & Light's hired engineers and marine biologists, since he had none of his own. He had engineers, but not marine biologists. In his report he quoted their data, no other.

After that, a permit was given by the Dade County Public Works Department to dig the canal Merchant of Venice style -- that is, dig all you want on your own and Seadade's land, but take not one drop of tidal land. A mile and a half long plug is left in a 6-mile canal to be fought over by our County Commission, State Cabinet, Florida Department of Natural Resources and thence on to the Federal Government.

We appealed the Pollution Control officer's decision, this time with an attorney and six or seven scientists, all of whom volunteered their services free of charge. Our attorney was told by the chairman that this resolved itself into a case of air conditioners versus alligators, and since I had been told the same thing a meeting or two previous, I surmised the direction our case was taking.

This same attorney has been your guide through this whole thing, so I won't go into the legal questions.

So, gentlemen, after some 14 Dade County Pollution Control Board hearings, five county commission meetings, one State Cabinet session, two Florida Pollution Control Board hearings and one Presidential Advisory Committee investigation, we fall exhaustedly into your jurisdictional arms.

Now, this has a certain comic quality. I must say that it is only after two years that I can see the joke at all, but I wanted to point out to you this. You can just think of the time I and the representatives of the Audubon Society have spent on this, not even to mention the scientists and engineers who have volunteered their time, nor even to mention our benefactor Herbert W. Hoover, Jr., who financed the now famous Thermal Effects report.

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Think of the ineptitude and mendacity we have had to deal with. Remember the promises of Florida Power & Light. Before they put in their present cooling system they said that if damage was done, they would put it aright. They first proposed a mangrove trickle method of cooling with ponds. And many thought this a great method.

Next came the Grand Canal. A better system said Florida Power & Light, which many people including government officials endorsed, and which didn't work. Then it was a simple canal to Card Sound.

"Infallible," said Florida Power & Light, and heads nodded from here to Washington. Now they want a canal with 150 percent dilution. "It can't help but work," says Bechtel, the AEC, Brown & Root, Rader & Associates, the University of Florida, Coastal Engineering, Dade County's Pollution Control officer, and various biologists, name of Lackey, and such.

But in testimony given by one of the company's vice presidents, there was a slight slip. He said the dilution system would work most of the time -- occasionally, though not often, getting as high as 98°F.

And they have hedged their bets a little more.

A 3 week survey of Card Sound is billed by Florida Power & Light as an "Ecological Study." I would say a 3 week ecological study is equivalent to going in an apple orchard in January and inquiring, "Who was the fool that planted these trees that yield neither fruit or leaves?"

This report concludes that Card Sound is very poor of life, and so the company proclaims that Card Sound is expendable. Indeed, should the system slip just a little, we can afford to lose it.

Since this is a conference on thermal pollution, I have not touched on the problems of radioactivity in local waters when the nuclear units are turned on next year. But I want to remind you gentlemen that the Fish and Wildlife Service report that warned of thermal pollution back in 1967, also foresaw a possible buildup of radionuclides in marine food chains since there were no strong tides to flush radioactive wastes out to sea.

MR. STEIN: Aren't they remedying that with the canal, giving them the strong tides to flush it out to sea?

MR. REDFORD: Well, we don't know, sir. Of course, both the power company and the AEC assure us that radioactive emissions will be well below safety levels, but so far have refused to tell us how much radiologically hot material will be put in their effluent, or just what these materials will be. In spite of their assurances I still feel nervous.

Nearby is a brand new National Park, the Biscayne National Monument. Seaward we have the John Pennekamp State Park, the first underwater coral reef park in the United States. The submerged lands of Card Sound belong to the people of Florida. So do the parks. Why should all this be sacrificed to provide one large corporation with an inespensive heat sink?

Reasonable doubt in any environmental agency's mind should force a ruling in favor of the condemned -- namely, our public lands and waters.

And lastly, why should the guardianship of public resources be left in the hands of a few private citizens?

If it hadn't been for the Izaak Walton League, Tropical Audubon Society, the Hoover Foundation and a few independent men from the Institute of Marine Sciences, Biscayne Bay would have been cooked long ago. Public policy demands for protection, and we ask just that.

I want to thank again all those who have devoted much time without reward to this battle, and for the chance to be in front of you. And I particularly want to add a good deal of thanks to Governor Kirk, to whom I can really say this is a tough issue, and we were very happy to see him do this.

One last point. I would like to point out -- I think the conclusion of all of this is, you have a county government who is making judgments that this particular board is taking a great deal of time in introducing a great many expert witnesses. We have no marine biologists in the employ of the Pollution Control Department; nor do I believe, although I would have to perhaps hedge this, even in the employ of Dade County.

We are making judgments on the hydrology and marine biology, and I don't think county governments or city governments, in most cases, are equipped to make these decisions without consultation with the State or Federal, and this has not been done.

MR. STEIN: Thank you, Mr. Redford. Are there any comments?

This is an excellent report. I am not going to comment on this specifically, because I think that you have had this from both sides. But I ask everyone -- this is really well written and an excellent statement. However, we are here in a conference. Now, we have two choices. Although you have a typical story of frustration as a citizens group, we have a situation that if we have a conference with Federal and State representatives here; if we are going to work out a solution -- we are going to have to, in some way, give all the parties to this controversy an opportunity to sit down and work this out. Otherwise, we have the issue of confrontation and a hard decision one way or the other.

At least from what I have heard so far, I do not think the situation has gone so far that we cannot work our way out. We have to accept certain physical facts that possibly we wouldn't have instituted. If we do that, it is the same kind of thing that we have had in other cases. In other words, the sheepman and the cattleman finally had to get together and sit down around the table.

Now, we can't make that decision for you. You are going to have to decide. I guess the people whom you have categorized very clearly in this paper you gave are going to have to decide whether they want to do that.

If you want to do that, we can use our good offices to work out an amicable solution if we can. If we can't, we are just going to have to follow this issue of confrontation and work it through. This is an issue that the citizens groups are going to have to consider as to which way they go. I am not making a judgment one way or the other on this. Am I making this clear, because I think this is a very important issue. Either we set up some kind of group, if we get a solution that we think will work, and try to get the Florida Power & Light and conservation groups together, or else we will have confrontation, and we will have to come up with Federal and State people at this table that are going to have to proceed and make the decision from our official position on the bench.

Ordinarily, if at all possible, the first alternative is the best. We hope that you people can still talk.

MR. REDFORD: We talk to each other. No problem there. I think the conference, if for nothing else, lets us every two years vent off our steam.

MR. STEIN: That is what I am saying. I want to make this clear, and I know both you conservationists and industry people have alluded to the same thing. You have been to the conferences and you have been to hearings before. I want to assure you that this is not like the other bug, because we are going to do something about this.

Now, the question is, we have this choice. Either we come up with a proposal that all the parties can sit down together and hopefully sign off and agree that this is the best, or we know we have a confrontation and we make the decision. Unless we get all the parties together we can't take the first course. Otherwise we'll have to accept the arguments and make the judgments. I would prefer the former.

MR. REDFORD: We'd be willing to join.

MR. STEIN: Mr. Reed.

MR. REED: The next is Thomas DeWolf.

THOMAS B. DeWOLF, ATTORNEY,
SEADADE INDUSTRIES, MIAMI, FLORIDA

MR. DeWOLF: Mr. Chairman, conferees, I wish to express my appreciation for the opportunity to explain our position in this situation before the conferees and for those interested.

I do have a brief prepared statement that I would like to read, and I do have some remarks that I would like to make relative to the subject.

On behalf of Seadade Industries, Inc., I wish to express our complete opposition to the proposed canal project which would empty the heated discharge water from the Turkey Point powerplant into Card Sound, after traversing 5½ miles of canal through Seadade property.

Seadade is presently resisting a condemnation effort which would grant title to a strip of land 660 feet wide and 5½ miles long through its property. The effect of the proposed canal right-of-way on the Seadade property is devastating. Because of the closed nature of the canal and the right-of-way, it effectively cuts off the waterfront portion of the Seadade property from the balance of the property and prevents the development of the property into the waterfront-type community which has been planned for its use.

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Because of the complete lack of planning for prevention of environmental pollution, including thermal pollution, discharge of radioactive wastes and infusion of biocides into the natural water, Florida Power & Light Company has chosen the worst possible site for the location of a large nuclear powerplant.

The damage which is being caused by the discharge of heated waters into Biscayne Bay, and the even greater damage which will be caused when the nuclear plants are completed and in operation, is now too well documented and substantiated to be questioned or denied. It is also well established that the discharge of the heated waters as proposed into Card Sound at the rate of 3 billion gallons per day will cause substantial biological damage and other adverse effects on the environment. These effects are heightened by the nature of the water and containment of Card Sound. The temperature of the water in Card Sound in the summertime is higher than the temperature in the bay and the tidal action, which determines the extent of flushing of the water, is considerably less than the tidal action in the main body of Biscayne Bay.

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Seadade, because of its direct involvement, has expended a great deal of time, effort and funds in exploring solutions to the thermal pollution problem created by the Turkey Point plant. We have reviewed the studies and data supplied by Florida Power & Light Company and have consulted with experts with respect to conclusions reached. We have reviewed the information furnished by the persons involved with environmental pollution, including the conservation groups, scientific and engineering organizations, university research departments, reports of governmental agencies and in reviewing present and planned installation of cooling towers and cooling systems for other powerplants. Our review, consultation and investigation leads to the conclusion that the solution to the thermal pollution problem does not lie in the construction of the canal project which is proposed by Florida Power & Light Company.

Our position may be better understood by a clear pronouncement of the following conclusions:

1. The canal project would not significantly cool the heated water from the plant. A continuing variance would be necessary in Card Sound of the water

quality standards of Dade County, the State of Florida and the United States Department of Interior acting through the Federal Water Pollution Control Administration. We do not believe these variances can or should be granted.

2. Other adverse effects, such as the concentration of radioactive material by certain marine organisms, the effect of concentrations of biocides, and the adverse meteorological effects of significantly altering the temperature ratio of the water in Card Sound to that of the surrounding area will cause damage to the waters of the bay and to the surrounding land areas.

3. The power company's position that the canal project would be less costly than other proposed solutions is not correct. When you take into account the devastating effect of the canal project on the development of the Seadade property and the fact that the canal project itself does not solve the thermal pollution problem, you have a fantastic financial blunder.

4. Although the power company has chosen the worst possible site for a large nuclear powerplant

at Turkey Point, there are solutions which are economically feasible and which do not involve the release of any polluted waters into the natural environment. A closed circuit cooling system using either evaporative or radiation-type cooling towers can and should be disigned for the plant. The plain fact is that the power company has not made an adequate study of any of these cooling systems to reach a conclusion that they are not feasible.

This was written before I heard the study this morning, but I would add to that that the study this morning did not consider completely the environmental protection that can be given by an enclosed cooling system.

Florida Power & Light Company must find or must be required to find, a reasonable solution to the environmental problems created by the Turkey Point plant; such solution must be compatible with the growth and development of the surrounding lands and not destructive to the marine ecology of the water of Biscayne Bay.

With that statement, Mr. Chairman, I would like to refer to some of the remarks that have previously been made. And I will not do so in any personal sense whatsoever, because we are not here dealing on that basis. And our relationship is such that we want to find a solution to this problem from our own standpoint because our land is involved. We own 5½ miles of waterfront on Card Sound and in Biscayne Bay, and, therefore, we do have a direct interest, aside from the natural interest that we'd have as citizens in the protection of this area.

We have participated in a number of proceedings involving this canal, including 1) the proceedings in the Circuit Court regarding the condemnation of the land, 2) the appeal of that decision, 3) and the consideration of the Pollution Control officer's report and study, and 4) the appeal which we participated in, along with the Izaak Walton League, before the Dade County Pollution Control Board of the decision of the Pollution Control officer.

I do have some observations that I think may be important on that point. The Dade County Pollution Control Hearing Board held a number of hearings -- about four actually. When we speak of months of hearings, they extended over a long period of time. But we began each hearing at 2 o'clock and terminated it generally between 5:00 and 5:30. So when we speak of months of hearings, in that sense, it is not months of continuous hearings by any stretch of the imagination, but there was an awful lot of evidence presented at those hearings.

Some of it you have heard today. Dr. Voss, for example, presented the Hoover Foundation Report, and his testimony regarding it, and the data on which he based it. There was other testimony in the record of considerable merit regarding the effects of thermal pollution in Biscayne Bay and in Card Sound.

The temperature standards were discussed. As Mr. Lewis has told you, the standard in Dade County is not simply 95°. It is a 95° limit, but it shall not be so warm as to cause damage to marine organisms. That is the standard in Dade County, and that was the standard that we were attempting to apply, determining at what level those damages occurred.

There was a lot of testimony in the record on that point. This testimony, however, had absolutely no effect in the Dade County Pollution Control Board hearing. The Board was at something of a disadvantage because it did not have the background nor the expertise to deal with the problem. And the concluding remarks of the Chairman of the Dade County Pollution Control Board are all too indicative of the futility which Mr. Redford has expressed to you in attempting to have a problem of this magnitude heard on that level. And I would like to quote those remarks from the Chairman of the Board at the conclusion of those hearings, and they are not too long. The Chairman said:

"I would just like to make one observation; that is, that this board has found itself in a very extremely difficult position because practically not a single thing has been said that has not been denied by someone else, or has been countered by some other kind of evidence. In other words, there has been no clear-cut evidence of anything much brought out to us, in our opinion, that has not been denied by people of good faith and good experience and qualifications.

"For example, I think that it has been shown that there has been damage at the Turkey Point discharge, but then water velocity is greater, the temperature is higher, and it is just not applicable to a carefully preplanned discharge in Card Sound.

"The same thing has occurred; allegations that we are going to change the environment by rainstorms and fog which was stated by some people well qualified and denied by other people well qualified.

"The fact that biological damage will occur has been stated by some and denied by others. In short, the board feels that there has been no definite proof of any facts which would lead us to reverse the decision completely.

"Now, on the other hand, the Board realizes there is a doubt, and for that reason we are trying to make the best provision for Dade County and everyone else concerned that we can by authorizing the partial use, first, to see what happens, and then on the basis of that authorizing the use of the other.

"The board regrets being put in the position --" And this is what I want to emphasize. "The board regrets being put in the position of trying to decide technical questions when you have two groups of marine biologists, two groups of engineers, etc. We are not capable of doing that. We have to have overwhelming evidence presented to us before we can make a decision of that sort. When things are presented and denied, we have no choice except to say that the burden of proof has not been met.

"That, I think, is the position that we are in. I hope that this decision will at least be satisfactory to some of the people. I think that it gives everyone a fairly good chance."

So that is the point I am making with respect to the board's position in this thing. The board chairman candidly admits that they were not in a position to decide this. And since they had decided as a matter of law that the objectors had the burden, and since there was evidence on both sides, they had to deny the request.

Now, that is not a way to solve the environmental problems. It can't be done like that. So from that standpoint, everyone involved, in my opinion, including Florida Power & Light Company ultimately, should welcome this type of an investigation when the expertise is available and where decisions can be made and reached. And if they are difficult decisions, then the sooner they are made and the sooner they are accepted the better off everyone is going to be.

There are several other observations that I would like to make very briefly.

MR. STEIN: While you are going to the next one, I would like to clear one point up. In case you don't know it, that is how I make a living. When the experts differ, we have to make a decision.

MR. DeWOLF: That is the whole point, Mr. Chairman. Other than that, it is meaningless to go before a board if they say, "There is interest on both sides; we can't make a decision; and, therefore, whoever was supposed to carry the burden of proof necessarily failed." That is not a procedure which can reach any ultimate conclusion.

On the other questions, I do question certain things. No. 1, the point has been raised that if there are problems in Card Sound after this discharge, elevating the water temperature, a net temperature rise -- and this is the whole key to the temperature situation; not what it comes out at or goes in at, but the temperature rise that you ultimately get after it goes through the condenser, and then cooled by dilution, or otherwise, and goes out in the bay -- you have to add that to whatever the ambient is.

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What we are talking about is a net temperature rise. And, in this case, with the dilution, with the canal to Card Sound, and that temperature rise still comes up to just about 6°F, between 5° and 6°, when we add that to the ambient, we are not talking about averages; we are talking about the temperature when the damage is going to occur. And we saw an illustration of that in the pictures yesterday morning, because those pictures were taken at a time when there was a kill of considerable proportions, and it was at that time that the temperatures were at their warmest extent, and the generating figures from Florida Power & Light Company will show you that.

So that we are talking about the extremes. And when we add from 5° to 6° to the extremes of temperature that they are talking about taking in, we get up to above 95° some of the time, even with the canal to Card Sound and the 150 percent dilution.

Now, there was testified to and verified in my cross examination of Dr. Dean in the hearings before the Pollution Control Board that at times the temperature would exceed 95° going into Card Sound with the whole operation. So we do have that situation.

Now, the Power Company has countered that by saying, "It doesn't matter. Whatever the situation is let's not play the numbers game. If it looks like it is going to get up that high, we will do something to curtail it," without expression as to what they were going to do.

One thing they told us today was that they would reduce the generating capacity of the plant, and by doing that they would bring the temperature down. This is the sort of assurance that they gave the board, too. But the fact of the matter is, if it were that simple, then they would not be presently violating the temperature standards in Biscayne Bay every summer since those two fossil fuel plants were installed. They could have reduced the generating capacity of those plants.

MR. STEIN: No, no. I think, as I recall this, this was made by one of their scientists who made it clear he was not speaking for the company. He said that to him the simplest solution would be to cut the power back. I questioned him on this. He indicated that he wasn't speaking for the company on that. Again, speaking for myself, I don't think that I regard that kind of assurance as one we can live with, expecting the power company to cut down on it. That is not a simple solution. That is a hard solution.

MR. DeWOLF: The other point is the question of what the temperature rise will be, which is speculation, because different numbers have been used. The operating capacity of this plant if operating at full capacity, would bring the temperatures, as I read this, above 15°. The normal operating temperatures of this plant, with the two nuclear plants in operation, would be about between 14° and 15° in normal operations.

Now, I do have the generating plant figures for a period of time during June and July of 1969, and these figures indicate definitely that the plant temperature rise in their present two fossil fuel plants goes up to 13°, 14° and 15° without operating at full capacity. In fact, their generating figures show a capacity of 780 megawatts of generating capacity operation, and then 15° temperature rise. So when they say they have to operate at full capacity in order to achieve 15°, their figures do now show that.

In fact, when their kills occurred in June of 1969, they were not operating at full capacity, and their temperature rise was up to 15°. So we are not talking -- we have to talk the numbers game to that extent, because these things do involve engineering questions and cannot be simply passed over by saying, "We'll do something about it." The saying that "We are going to do something about it" has to be considered. If it is not compatible to the situation then something has to be determined.

We do have, Mr. Chairman, an expert here also on the question of cooling towers. And I had an expert yesterday and this morning on meteorology, because we did have testimony before on the effects of putting this much heat load into an area like Card Sound -- the effects it would have in the surrounding area. This we consider as thermal pollution, but since the court -- the conferees have indicated that Mr. Dunn could not testify on that, although he submitted his statement, I would like to submit the statement of our meteorological expert on that subject and not have him testify.

MR. STEIN: All right.

1) (The above-mentioned statement follows;

2) Also see letter and statement beginning page 833, which was submitted later by Thomas B. DeWolf.)

STATEMENT OF DR. CHARLES L. HOSLER

THERE HAS BEEN A GENERAL AWARENESS OF THE DANGER OF POLLUTION AS A RESULT OF MANY INDIVIDUAL CONTRIBUTIONS AND THERE ARE SIGNS THAT THE NATION IS READY TO MOVE AGAINST THIS. THERMAL POLLUTION OF WATER AND AIR AND THEIR IMPACT ON WEATHER ARE RECENT DEVELOPMENTS WHICH WILL RAPIDLY GAIN THE NATION'S ATTENTION. MODERN POWER PLANTS ARE OFTEN 10 TIMES LARGER THAN THEIR PREDECESSORS AND HAVE NOW REACHED THE SIZE THAT RESULT IN THE DUMPING OF ENERGY COMPARABLE TO THE ENERGY DISSIPATED IN A THUNDERSTORM. THE TURKEY POINT PLANT OF FLORIDA POWER AND LIGHT WILL BE SPREADING ENOUGH HOT WATER OVER THE SURFACE OF CARD SOUND WHICH, IN ADDITION TO KILLING MOST OF THE LIFE IN THE SOUND, WILL FREQUENTLY CAUSE A LINE OF CLOUDS TO FORM DOWNWIND AND WILL FOCUS SHOWERS DOWNWIND. BOTH THE HEAT AND THE EVAPORATED WATER WILL ADD TO THE ENERGY AVAILABLE FOR SHOWERS AND THUNDERSTORMS.

ON CLEAR COOL NIGHTS THE ADDED MOISTURE IN THE LOWER LAYERS OF AIR WILL CAUSE FOG TO FORM SOONER AND MORE OFTEN THAN IS NOW THE CASE. HUNDREDS OF HOURS OF ADDITIONAL FOG WILL ENVELOP THE AREA ADJACENT TO CARD SOUND AND THE 5 MILE LONG HOT WATER EFFLUENT CANAL.

OVER A PERIOD OF ABOUT 20 YEARS I HAVE BEEN STUDYING THE INFLUENCE OF SMALL SURFACE FEATURES ON WEATHER

PATTERNS AND, WHETHER IT IS A SHOWER WITHIN A MAJOR WEATHER DISTURBANCE OR AN ISOLATED SHOWER, EACH CLOUD AND EACH SHOWER IS SET OFF BY SOME MINOR DISTURBANCE--THEY DON'T JUST OCCUR BY CHANCE. EACH ONE HAS A CAUSE. QUITE FREQUENTLY IN SOUTH FLORIDA THE ATMOSPHERE EITHER REMAINS FOR A LONG TIME, OR PASSES THROUGH STAGES WHERE VERY SMALL DIFFERENCES IN SURFACE TEMPERATURE AND HUMIDITY OVER AREAS OF MORE THAN SEVERAL SQUARE MILES WILL PLAY IMPORTANT ROLES IN DETERMINING WHEN AND WHERE INDIVIDUAL SHOWERS OR CLOUDS WILL FORM.

RESEARCH STUDIES AND SATELLITE PHOTOGRAPHS SHOW VERY PRONOUNCED REGULARITY IN THE PATTERN OF CLOUD AND SHOWER FORMATION AROUND THE BODIES OF WATER WITHIN AND SURROUNDING FLORIDA. JUST AS AN ISLAND OR ATOLL CAUSES SHOWERS AND CLOUDS DOWNWIND, A LARGE AREA OF WARM WATER WILL BY HEAT AND WATER ADDITION TO THE AIR PROMOTE CLOUD FORMATION. WHAT AMPLIFIES THE IMPACT OF A PHENOMENON SUCH AS WILL OCCUR OVER THE HOT WATER EFFLUENT IN CARD SOUND IS THE LARGE AREA, ALWAYS HOTTER THAN THE SURROUNDINGS, WHICH IS THERE DAY IN AND DAY OUT ALL YEAR ROUND, AVAILABLE TO TRIGGER THE ATMOSPHERE WHENEVER IT IS IN AN UNSTABLE STATE. A LARGE AREA OF UNIFORMLY WARMER TEMPERATURE THAN THE SURROUNDINGS ORGANIZES A LIFTING OF AIR AND TRIGGERS THE RELEASE OF LARGER AMOUNTS OF NATURALLY AVAILABLE ENERGY. ONCE

THIS ORGANIZED SHOWER FORMATION BEGINS IT WILL DOMINATE SUBSEQUENT CLOUD DEVELOPMENT IN THE AREA. THE LARGE HOT AREA ACTS LIKE THE MATCH THROWN IN THE DRY FOREST OR FIELD OR THE FIRST HOLE IN AN EARTHEN DAM. ONCE THE FIRE OR WATER FLOW HAS STARTED IN ONE LOCATION IN A SMALL WAY, IT SETS THE PATTERN FOR EVENTS OVER A MUCH LARGER AREA, RELEASING MUCH LARGER QUANTITIES OF ENERGY THAN WERE NECESSARY TO START THE PHENOMENON.

THE 30 FT. DIKE EXTENDING FOR 6 MILES ACROSS THE REGION WILL ALSO CONSIDERABLY ALTER THE DRAINAGE OF COOL AIR AT NIGHT RESULTING IN A DAM TO HOLD THE FOG FORMED IN THE LOWER LEVEL JUST AS POCKETS OF FOG NOW FORM IN THIS AREA IN THE EARLY MORNING. IN SHORT, THE DUMPING OF BILLIONS OF GALLONS OF HOT WATER INTO CARD SOUND EACH DAY WILL CAUSE IMPORTANT CHANGES IN WEATHER PATTERNS IN THE AREA FOR TENS OF MILES DOWNWIND.

THERE ARE ALTERNATIVE HARMLESS WAYS OF GETTING RID OF THE WASTE HEAT WITHOUT DISTURBING THE ENVIRONMENT AND DESTROYING THE SOUND FOR GENERATIONS TO COME.

Qualifications of C. L. Hosler

Re: Seadade Environmental Modification

For the last five years I have been consultant to Esso Research and Engineering, Linden, New Jersey. During this period we have studied sites in Australia, Africa, and South America with respect to their suitability for a weather modification experiment. We have selected a site and this fall a 4 to 8 million dollar pilot experiment will begin. This involves altering land surfaces using an asphalt coating (20 to 40 square miles) to alter their response to solar radiation and regulating the moisture balance. Numerical models show strong positive effects possible from contiguous areas which produce only a few degrees of heating. The consequence is frequent shower formation and fixed location.

For the past two years I have worked with Gilbert Associates, Inc. of Reading, Pennsylvania in assessing the weather and climate modification produced by large cooling tower installations at the Keystone power plant in Indiana, Pennsylvania and for the 1,800,000 KW 3-mile island plant (nuclear) now under construction near Harrisburg, Pennsylvania.

I have also been consulted by New York State Gas and Electric on their proposed nuclear plant on Cayuga Lake and its thermal and moisture effects on local weather. EG & G Corporation Environmental Service organization in Boulder, Colorado has also called upon me to plan their studies of the effect of 14 proposed power stations in Oregon.

For the past ten years I have been supported by the National Science Foundation to the extent of over one million in research funds and about five million in equipment to study the effect of local terrain and water bodies on weather and climate. These studies have included areas in Central Pennsylvania, Lake Erie Shore, Flagstaff, Arizona, and my staff and aircraft are currently on St. Croix, Virgin Islands, examining the effect of the island on shower formation and the effect of cloud treatment on the time of onset of rain.

I am currently serving on the Atmospheric Science Panel, Advisory to the National Science Foundation and the Advisory Panel to ESSA of the National Academy of Sciences. I have in the last few years also served as consultant to the U. S. Department of Commerce and to the Secretary of the Interior (Udall) on weather modification matters and to devise a national plan. I am by state law a member of the Pennsylvania Weather Modification Board. I am commissioner for Education and Man Power of the American Meteorological Society and serve on numerous other committees and panels.

CHARLES L. HOSLER

Biographical Sketch

Born in Honey Brook, Pennsylvania - 1924

Studied at the Pennsylvania State University, Bucknell University and Massachusetts Institute of Technology. Received B.S. - 1947; M.S. - 1948; Ph.D. - 1951 in Meteorology from the Pennsylvania State University.

Served in the United States Navy 1943 - 1946 as aerologist and observer in typhoon reconnaissance in Pacific Asiatic Theatre. Now a Lt. Commander, USNR.

Since 1948 has been employed at Penn State as instructor, assistant professor, associate professor, professor of meteorology and head of the department of Meteorology and is currently Dean of The College of Earth and Mineral Sciences. The College of Earth and Mineral Sciences carries out a broad program of instruction and research aimed at the application and extension of our knowledge of the earth and its environment using all of the tools of science. He teaches undergraduate and graduate courses in meteorology and conducts research. Has led research projects for the United States Air Force, National Science Foundation, United States Weather Bureau in the physics of clouds and weather modification. Has published over 50 scientific papers in periodicals and books in this country and abroad. Prepared 20, one-hour video tape lectures on weather, which are being used on Educational and Commercial T.V. As hydrographer for the Pennsylvania Department of Forests and Waters, he supervised the collection and dissemination of river and rainfall information for the West branch of the Susquehanna and the Juniata Rivers for the Federal State Flood Forecasting Service from 1949 to 1959. Has served as consultant to three United States Senate Committees and the President's Advisory Committee on Weather Control, and as an industrial consultant on prediction of fall-out, design of satellite experiments, weather modification, etc., and as an expert witness in a number of court cases hinging upon weather phenomena. He has been consultant to such firms as HRB Singer, Esso Research and Engineering Company, Nuclear Science and Engineering, Hazleton-Nuclear Science Corporation, McDonnell Douglas Corporation, Midwest Research Institute, U.S. Department of the Interior. Has delivered over 400 talks on weather prediction and control to groups in the United States, Canada, England, Finland, Italy, Australia, Switzerland, France, India, and Japan. Traveled and toured laboratory research facilities in these countries as well as a number of others including the Soviet Union in 1961. Conducted a daily television program on current weather over channel 10, Altoona, Pennsylvania, from 1957 to 1966. Served as visiting professor at 5 colleges and as visiting scientist for the American Meteorological Society, has lectured at 30 other colleges and universities since 1959. He serves on committees and panels such as: The weather modification panel of the National Science Foundation, Cloud Physics Committees of the American Geophysical Union and American Meteorological Society. Member of the Board on T.V. and Radio Weathercasting and Board on Higher Education in meteorology of the American Meteorological Society.

Member of: American Meteorological Society
American Geophysical Union
American Association of University Professors
American Association for the Advancement of Science
Sigma Xi
Tau Beta Pi
Alpha Phi Omega

Hobbies: Hunting, fishing, canoeing

Thomas B. DeWolf

MR. THOMAN: Mr. DeWolf, I have a couple of questions. So I get my facts straightened out here, Florida Power & Light filed a condemnation suit against Seadade for the taking of this amount of land that you mentioned.

MR. DeWOLF: Yes, sir. The judge in this particular case found in favor of the Florida Power & Light Company.

MR. THOMAN: And you appealed this?

MR. DeWOLF: Yes.

MR. THOMAN: Have you exhausted your appellate remedies?

MR. DeWOLF: No, we have not exhausted them. We have a decision by the District Court of Appeals for the Third District in which they say these items of environmental effects, etc., cannot be considered by them at this time. If at any time it appears that they would be in violation of the rules and --

MR. THOMAN: You are interested about the taking of the land for the canal. In other words, have you exhausted all of your appeals on the taking of the land?

MR. DeWOLF: No, we have not; but they have a right to proceed.

MR. THOMAN: What remains in due process of law for you to go through with against them?

MR. DeWOLF: We'll file a petition for rehearing in the present appellate proceedings. If at any time it appears that this canal project is not feasible, we will move before the court to reconsider the order of taking. That is always open. But on the appellate process we will file a petition for rehearing on the present appeal. If that is denied we will file a petition to the Supreme Court of Florida.

MR. THOMAN: Meanwhile, as I understand it, they have the right to proceed with digging the canal?

MR. DeWOLF: They do because we went in, moved for a stay order on the digging of the canal, particularly after the letter was written to them by the Florida Air and Water Pollution Control Board, and the testimony that was given by Mr. Marshall in the proceedings before the Dade County Board indicated that this conference was coming up and requested them to withhold the activity.

The court, however, did not stay the effectiveness of the order of taking. They did not give an Opinion on that. They simply entered an order; so I do not know what the status of that is in their Opinion. But they specifically say in their Opinion on the appeal that these matters are not something that they can take into consideration.

MR. THOMAN: Thank you very much. I still don't completely understand. The "honorable mouthpiece" says he does. I am no lawyer, and I guess I am evidencing my ignorance.

What I was trying to find out basically and simply: Does Seadade have any remedy left that they can stop Florida Power & Light from digging that canal?

MR. DeWOLF: An appeal order of the stay order would not be likely at this time, no. The only remedy we would have left would be a suit on our own in Federal Court contesting the validity of the transaction.

I do have a witness that I would like to present.

MR. STEIN: Yes, but before you go, I would like to raise one point, Mr. DeWolf, with you. This is a very significant point and you may not want to answer it. I don't know if you were here and heard the testimony on the quality of waters in Lower Biscayne Bay.

MR. DeWOLF: Yes, sir.

MR. STEIN: They were very high.

MR. DeWOLF: Yes.

MR. STEIN: This kind of water quality reminds me of what we had in Lake Tahoe. You are against putting in the heat. You are against the canal. What is the alternative that you are offering -- housing development on the shores of Biscayne Bay, so that you have a condition like you have in North Biscayne Bay? If we are going to protect the bay -- and I say we have to approach it in an open way -- I don't know if you suggest that we protect the bay by putting the housing all along the shores and discharge that waste there.

MR. DeWOLF: This matter is being considered very carefully from the Trustees of the Internal Improvement Fund on the question of housing density and other developments. I have no doubt that anything that we do would be very carefully planned in advance. In fact, we have hired Wilbur Smith Associates, probably the best planner, in our opinion, around in that field, with the specific instructions that it be done in such a way that it will not involve environmental damage.

MR. STEIN: I hope not. But let me make this clear. We have gone in on several cases before and there is just so much you can do in the pollution field. For example, in Lake Tahoe, it was given what they call the highest possible treatment by taking the effluent out of the basin and not putting it back in, treated or untreated. They are putting up big housing developments, and the Harris Club is putting up a 1600 room motel on the shores of the lake. I don't know that there is anything we can do in pollution control to save Lake Tahoe as far as those waters go.

The point is the people of Florida are going to have to recognize this. If we have a problem here in keeping the waters from deterioration from the effect of the powerplant, I hope we are not protecting it for this kind of development that we find we have in other areas that inevitably caused those waters to deteriorate.

This is something that I think we have to really look at very carefully. Otherwise, we are kidding ourselves in this whole procedure.

MR. DeWOLF: I have no doubt that the points that you raised are matters which have been and will be given a great deal of consideration, and I expect that the Federal Water Pollution Control Administration will also give them continuing consideration.

We are not here to use it in any way that would constitute the same or differerent types of pollution. If it can't be done without it, then we are stuck.

MR. STEIN: All right.

MR. DeWOLF: We do have a witness. Mr. Peter Phelps that I would like to call upon at this time.

MR. REED: Is Dr. Hosler going to testify?

MR. DeWOLF: No. He was.

MR. REED: Mr. Phelps.

PETER M. PHELPS, CONSULTANT,
SEADADE INDUSTRIES, INC.,
KENTFIELD, CALIFORNIA

MR. PHELPS: I would preface my statement by saying in reference to Mr. Lyerly's report I have not seen the report. To the best of my knowledge, there would be no conflict between the figures that I would report, and the figures that Mr. Lyerly has already reported.

Peter M. Phelps

My name is Peter M. Phelps. I am a mechanical engineer residing in Kentfield, California.

From 1948 unitl the present time I have worked in the cooling tower field. Until 5 years ago I was with Fluor Corporation, a manufacturer of cooling towers. At the time I left them I was manager of engineering. During the time I held this position, we developed what is today Fluor's basic cooling tower design for powerplant applications.

Since leaving Fluor, I have acted in the capacity of consultant to various parties on the design and application of cooling towers, including large towers handling high volumes of water for powerplant application.

Thermal rejection from any industrial plant involves heat transfer into a medium, and subsequently conveying this medium away from the source of thermal rejection. In the absence of a so-called "total engery" complex where heat from a dominant source can be transferred to some other lower energy demand, this thermal rejection is normally dispersed into either water or air at or near the plant site. Subsequently, most of it is ultimately released to the atmosphere either by diffusion from the heated air into the surroundings, or by evaporation, etc., of the water into the surrounding air. Such evaporation, conduction, etc., can be accomplished over a relatively long time from large water bodies such as bays, rivers, or ponds, or over a relatively short time in a confined heat exchange device such as a cooling tower. Compromise systems using spray nozzles installed above large bodies of water to enhance surface evaporation and cooling have also been used.

A so-called "dry" cooling tower accomplishes the above confined heat transfer by circulating water (or other media) through tubes which in turn are cooled by contact with the air. The "wet" cooling tower circulates and partially evaporates the water, thus cooling it by direct contact with the air. Without belaboring the reasons, evaporative cooling is much more effective from a purely cooling viewpoint, than "dry" cooling. No more than 1 percent of the water need usually be evaporated to achieve each 10°F. of cooling of the remaining water.

Good engineering practice dictates that both "dry" and "wet" cooling be evaluated for a cooling tower installation, particularly in areas where water to replenish that evaporated has been proven to be in short supply. Salt or brackish water has been used in "wet" cooling towers (hereinafter called just "cooling towers") where freshwater is not available. The water cooling system thus becomes saline, necessitating that plant equipment be suitable for salt water operation. And in the case of the cooling tower design, corrections must be made to compensate for the reduction in evaporative effect of salt water as opposed to that for freshwater. As water evaporates, salt is left behind in the cooling tower. Even in a freshwater cooling tower dissolved solids are left behind, and, theoretically, a salt water condition could untimately be achieved in a freshwater system unless salt buildup is controlled. This is normally accomplished by bleeding off and disposing of a small portion of the water (called "blowdown") and increasing the makeup water to replenish the evaporation and this blowdown. Cooling towers have been designed to incorporate zero blowdown from the system, but naturally it is cheaper to merely dispose of it in a river, a sewer, a well, a bay, or whatever might be available. In addition to blowdown, some water is carried out of the cooling tower by the air stream as "drift." These "drift" droplets are very fine and constitute a small percentage of the total circulation (as low as 1/20 of 1 percent), but can be objectionable, particularly if salty. At Turkey Point drift can be held to around 200 tons per day of salt.

The evaporation in a cooling tower can at times result in a condensation of the water vapor into a "plume" when it exhausts into cold air. Such plumes are quite common in early winter morning in many parts of the country.

For seashore plant sites, the following cooling tower systems can be designed and should be evaluated:

(a) "Dry" cooling towers. No plume, no drift, no evaporation, but costly. A recycling closed system.

(b) Freshwater cooling tower. Some evaporation and drift, but much lower in cost. A recycling closed system.

(c) Salt water cooling tower. Some evaporation and drift and cost slightly higher than "b." Requires blowdown.

(d) A combination of any two, or even all three of the above, with the plant duty split and segregated to each.

(e) Salt water cooling tower with part fresh and part salt water makeup. Can be more corrosive than sea water necessitating special corrosion inhibition treatment and possibly chemical treatment of blowdown.

(f) Once-through salt water cooling tower. The full plant circulation rate is cooled and then returned to the bay at slightly higher salinity (1-2%).

(g) Mechanical draft cooling towers. Air flow through alternates "a" through "f" is induced by action of fans.

(h) Natural draft cooling towers. Very high towers (4-500') wherein air is caused to flow by "stack" effect of the hot exhaust air stream. Lower ground area is usually required than for "g," but tower is quite expensive. Drift is reduced.

(i) Combination of "g" and "h."

These studies may very well already have been completed for the Turkey Point project.

Certain comments should be made about the above, as they relate to the Turkey Point project. In the first place, all the systems will operate effectively even at zero wind circulation across the area. Cooling ponds are sensitive to wind velocity. With cooling towers, powerplant output need not be adversely affected on hot, calm days.

Salt water cooling tower systems can be designed to include dilution with bay water if desired. Such would be necessary at times during the winters to reduce the temperature of water returned to the bay (even blowdown) to within 4° of ambient temperature. Reduced powerplant load in the winter would of course help this problem.

On the other hand, since cooling towers are more effective than cooling ponds under summer conditions, it is possible to achieve cool water temperatures lower than those recorded in the bay. In any case, it is possible to design cooling towers which can be used on a once-through system and will recirculate water to the bay at ambient bay temperatures for essentially the entire summer. This would make it possible to return cooled water to the bay at a point quite close to the plant intakes. In this case, the bay would provide the makeup requirements for the entire plant amounting to something just over 50 million gallons of water per day under full load conditions. This could be interpreted as being a "closed" system.

All cooling tower systems, like any other cooling system, must be paid for, not only in first cost and operating cost, but in the indirect and sometimes indefinable side-effect cost, such things as makeup and blowdown effects, drift effects, and effects of hot air discharge must be allowed for. Once having balanced these effects against the disadvantages and unknowns inherent in any other cooling system, the selection of cooling tower cooling will result in an installation of high predictability and reliability. Such a system provides protection against discharge of large quantities of excessively heated water into the bay at the Turkey Point plant.

MR. STEIN: Thank you, Mr. Phelps. Any questions or comments?

MR. REED: Yes. Is there a designed building in the United States or in the world of a cooling tower that has handled anything like the volume of water that is predicted for the Turkey Point plant?

MR. PHELPS: Not to my knowledge. Salt water cooling tower?

MR. REED: Yes.

MR. PHELPS: For the total volume of water that is predicted for the Turkey Point plant, no.

MR. REED: Anything near the magnitude of that amount of water, or half the magnitude?

MR. PHELPS: Let me explain something about the cooling tower. When you talk about the size of the cooling tower, particularly in the case of a mechanical draft cooling tower, the manufacturer starts with a basic unit which is called a "cell," and this may be something that is 75 feet wide or perhaps 30 feet long, and maybe 5 feet high, and as he requires more cooling he builds more and more of these cells.

Now, as those cells increase in length, it is not so much a problem of design for the cooling of the water as it is to design the long tower for its own effect on its own air supply.

Air currents blowing across the cooling tower will influcence the performance of that. So the problem of going to a large cooling tower is knowing how to design for air circulation, because the water circulation can be duplicated from one cell to the next. So in terms of what I think you are trying to arrive at: Is there expertise in very large salt water cooling towers? The answer would be "yes."

The thing that the manufacturer has to know is coming through with a cooling tower for you is what effect the air currents will have on that long structure. Knowing that, which he could get from any type of cooling tower, be it freshwater, or salt water, then he is capable of designing as large a cooling tower as would be necessary.

MR. THOMAN: Mr. Phelps, to your knowledge what is the largest freshwater cooling tower system of this type?

MR. PHELPS: I am not sure. I would say possibly the Oak Ridge installation. Of course, frankly, in the last 5 years, even that has dimmed somewhat by some of the very large powerplant installations -- the Keystone project, some of those up in Pennsylvania and West Virginia.

MR. THOMAN: Some of those, if I remember correctly, use the natural draft?

MR. PHELPS: Yes. Now, in this area natural draft suffers a bit because of the air currents. The air properties in this area are not conducive to good natural draft effects. It would take a complete exercise in design and cost for a cooling system to know how it would balance out. However, I would expect a fan-operating cooling tower would be far cheaper in this area.

MR. THOMAN: This may be an unfair question. As a rule of thumb, would you have any percentage of the capital cost of a powerplant that would install a system of this type?

MR. PHELPS: Yes. For a dry cooling tower it would be 20 percent.

MR. THOMAN: Of the total capital cost?

MR. PHELPS: Yes. That would be a dry cooling tower. Now, it can range down there from --

MR. THOMAN: How about the type you were speaking of, I believe you called them a "mechanical evaporating cooling tower." Is that what you called it?

MR. PHELPS: That could be under 10 percent. The reason I hesitate a bit is because it is a very hard figure to give. It depends on the kind of hardware you are going to use. If you have salt water you have to have corrosion resistant hardware.

MR. THOMAN: Let me ask you this. For a cooling tower, freshwater vs. salt water, what would be the relative cost increase because of using salt water? Is it a hundred percent or fifty percent?

MR. PHELPS: Well, in some cases it is hard to measure, but it could go as high as 10 or 15 percent.

MR. THOMAN: More than the freshwater system?

MR. PHELPS: More than the freshwater system. This is just the cooling tower. There would be other factors, too.

MR. THOMAN: The fans and piping?

MR. PHELPS: Yes, and condensers.

MR. STEIN: How much more would the total be if you were going to go to salt water rather than freshwater?

MR. PHELPS: Well, at the worst 10 percent of the plant? Is that what you mean? One pecent.

MR. STEIN: That is what I mean—that these figures startle me somewhat. If we are talking in terms of cooling towers, we didn't face salt water problems, presumably, in dealing with the costs involved.

You could solve this operation if you had freshwater for cooling by using cooling towers. If you are just going to raise the cost 10 percent of the cooling towers, this doesn't seem to be much of a differential.

MR. PHELPS: You mean by going to sea water?

MR. STEIN: By going to sea water.

MR. PHELPS: It is not too much. I can give you about how much that would run. We had an experiment one time with a situation of a psychrometer which measures how low you can cool. We used distilled water and salt-ladened water, and the total difference between the two psychrometers was 2°. Now, sea water or a combination of sea and freshwater would be somewhere between the two.

MR. THOMAN: We were just trying to get some handle on the cost. To make sure that I understand, it would cost with a freshwater cooling system mechanically evaporating something under 10 percent of the capital value of the powerplant?

MR. PHELPS: Which you would have to add the power to run the fans if you have fans.

MR. THOMAN: And if you went to salt water it might increase the cooling towers themselves at 10 percent -- just another 10 percent?

MR. PHELPS: Yes. If you get into a closed salt water system, then it becomes a little sticky because your salt concentration is going higher and higher and higher. Frankly, I think the power company would be discouraged long before then just by the effect on the condensers.

MR. STEIN: Let me see if I understand you. You define what is essentially a "closed system" in the last part of your statement. You are talking in terms of using part of the bay, putting the material back into Biscayne Bay and using that as the intake water again?

MR. PHELPS: In a sense, that portion of the bay is included in the whole cycle.

MR. STEIN: Your system would be to dedicate a part of the bay to that alleged "closed system?"

MR. PHELPS: That is right.

MR. STEIN: How much of the bay would have to be dedicated?

MR. PHELPS: I'm sorry. You have now exceeded my expertise.

MR. THOMAN: That was just for makeup water, wasn't it?

MR. PHELPS: No.

MR. STEIN: No, no. He means that goes to the cooling tower, out into the bay, and back into the intake, and that is what he calls essentially a "closed" system. This gets very interesting. Can you guarantee lack of drift with a system like that? What are the chances of drift? Can you guarantee no drift?

MR. PHELPS: No, I don't believe you can quarantee no drift with any wet cooling tower.

MR. STEIN: You can guarantee no drift with a dry cooling tower.

MR. PHELPS: Dry cooling.

MR. STEIN: But you don't recommend the dry cooling tower?

MR. PHELPS: It's wonderful, if you can afford it; yes, I recommend it.

MR. STEIN: What is the price on that?

MR. PHELPS: That is the one that will run you 20 or 25 percent of the cost of a plant. It is an extremely expensive alternative. It is a workable alternative.

MR. STEIN: The difficulty that we find ourselves in is that we have all of our cards on the table and we have our expert on cooling towers. I don't know if you met him -- Frank Rainwater there in the blue shirt. We know about it. Now, the question is if we are going to have a viable alternative, and we don't have a drift problem, do we have the alternative to solve it? Or , are we just going through one of these exercises? Would it be better if you came up with a "closed" system which is so expensive, or came up with an open system that might be desirable but you had to reject on the point of the drift? In other words, let me indicate this to you. You are a consultant in the field. Do you think if the Government hired you and we owned this plant that you could recommend the system which you could guarantee to work, be free from drift and not hurt the surrounding territory and yet not be too expensive?

MR. PHELPS: All those?

MR. STEIN: Yes. Otherwise, what do we have to move on?

MR. PHELPS: First of all, you have injected something in here that any manufacturer, any consulting engineer cannot do, and that is to say, Can you guarantee that you will have no deleterious effect? Nobody would know exactly what the deleterious effect would be without knowing the currents and the makeup of the surrounding area. That could not possibly be done. The only way you can be sure of escaping drift is to have a dry cooling tower. But, again, let me mention one thing: Drift is always present in a cooling tower. It is always present. The question is, how much?

MR. STEIN: That is right.

MR. PHELPS: How much? Now, any plant that is operating today even on freshwater is going to put salt and miscellaneous chemicals out in the top of that tower. They can spread it around.

Down here, of course, if it were a salt water system that you went to, it would involve sea water drift. In other places the salinity is maybe 1/10 of that, or a third, whatever it may be. The alternative to the drift problem, if that is the problem, is to find sources of freshwater and use the freshwater cooling tower.

MR. STEIN: This is what we are exploring. If there were an abundance of freshwater, I think all of us would be off and running with a "closed" freshwater system. I am not sure that we would have had these hearings in the State, etc.

We are exploring this. Let's proceed as though we had to use salt water. Let's proceed on the assumption that if we are going to get the industry to accept something, it is going to have to have something at a reasonable cost or face a legal battle. Let's proceed on the assumption that we are going to have no drift where you get a reasonable protection.

The difficulty that we find in the power industry generally is that they buy their components on a guaranteed basis. Let's assume this is one of these quasi-public regulated operations, and I guess this has grown up in the trade and nuisance of the trade where for one reason or another they don't buy anything and take a chance. They get a manufacturer's guarantee. That's normal.

What you are saying is that no guarantee is forthcoming; therefore, they are going to have to buy with a contract that is outside the usage of the trade.

MR. PHELPS: When you say "no guarantee," guarantees can be given for the performance of the tower itself. The thing that cannot be guaranteed is for the effect of that performance on surrounding territory or the surrounding area. I am speaking of drift.

MR. STEIN: That is why we are here. We are interested in the effect on the surroundings. Otherwise, we wouldn't be here at all. In defense of the cooling tower, which I believe to be in fashion at this session, I will say that a cooling tower has been a well proven device for many years and has drifted for many years. The drift has been improved upon for many years, but it still will drift. Yet, every large power installation where there is some shortage of water has cooling towers.

I think you have given us a very handy statement. It has been very helpful to us. I think every statement you made, as far as I know, is deadly accurate. It is a very difficult problem.

Are there any further questions?

MR. THOMAN: Yes. I want to make one in case I confused the issue, or you don't understand me, Mr. Stein. I don't think Mr. Phelps did.

In your statement you say, "In any case, it is possible to design cooling towers which can be used on a once-through system and will recirculate water to the bay at ambient bay temperature for essentially the entire summer. This would make it possible to return cooled water to the bay at a point quite close to the plant intakes. In this case, the bay would provide the makeup requirements ..."

Now, in the system, Mr. Phelps, that you were describing, you wouldn't be dedicating a portion of the bay to the cooling process?

MR. PHELPS: Not to the cooling process. Only to the hydrological process of getting it back to where it would be cool.

MR. THOMAN: I wanted to make sure that that was made abundantly clear.

MR. REED: I needed that myself.

MR. STEEL: Mr. Chairman, we have held Mr. Lyerly. Do you want to examine him any further at this time?

MR. STEIN: Let me indicate, as we pointed out, Mr. Reed is managing Florida's time. The participants are at his discretion.

MR. REED: Let me say this, I am sure that we want to hear from Mr. Lyerly. I have broken in through the regular agenda so we can have distinguished Ralph Poston to speak next, because he is on a time schedule. Then I have one other gentleman on a time schedule. And I think it is very apparent that we will not conclude today, so we will have plenty of time if you can hold him.

We have to give this room up at 5 o'clock to the hotel. They have made that abundantly clear.

MR. STEIN: If we are not going to conclude today, we will recess at 5:00 then.

MR. REED: Yes. There is another small room available apparently downstairs that we can continue in tomorrow.

Senator, please proceed.

THE HONORABLE RALPH POSTON,
STATE SENATOR, MIAMI, FLORIDA

MR. POSTON: Mr. Chairman, as a member of the Natural Resources and Conservation Committee of the Florida State Senate, I have been concerned naturally with these proceedings and the ultimate outcome of them. I am concerned for a number of different reasons.

The Honorable Ralph Poston

One of them is that during the last session of the legislature when our Pollution Control Act was introduced and was debated before our committee, concern was expressed from Dade County that we did not need pollution control on a State level; that it should be left on a local level. I was criticized for taking the stand that we needed it on a State level. The reasons were that if we had a plant in Broward County that was on a river that flowed from Broward County to Dade and it was polluted in Broward, we would have no way of controlling the pollution flowing into this county, and, consequently, on a State level we needed to have control and an overall view of the pollution in the State.

Now, the question that comes to my mind -- and I would like to state that I have a high regard for Mr. Reed and Mr. Patton and the work that they have been doing on a State level. I would like to ask Mr. Reed a question, if I might.

Did the State exhaust all remedies in seeking a solution to this particular problem under the Pollution Control Act of 1968, prior to the Chief Executive's seeking a commission to sit in hearings on this matter?

MR. REED: Senator, the answer would be the alternatives that the Governor was faced with -- to dismiss the local program for not having carried out its official functions. If so, the State of Florida would have had to have entered a case against the local program and it would have taken months, and they might not have been successful.

As you know, the last session of the legislature authorized local programs and gave us further option as to whether we had the right to accept them or not accept them if they met certain regulations.

The route that the Governor chose has been followed in many other States. Most of the States of the Union have chosen this type of hearing when a problem was beyond the expertise of the local Pollution Control Board, or beyond the expertise of the State regulatory board. And I would submit to you, sir, we have a case here which is finite in its difficulty. I would suggest to you, sir, that we have heard competent testimony today and yesterday by highly qualified experts that do not agree in substance, or in many cases do not agree even on very small items in the testimony.

We are in an area of unknowns hardly matched in any environmental sense in the United States today, possibly in the world. We are involved by going into a nuclear energy plant. We are involved in thermal standards which we are just groping in our knowledge. And it was the Governor's hope that we could bring at a conference like this the best expertise in the United States together, to try to find an equitable solution to the power needs of Dade County and the need to preserve the integrity of Biscayne Bay and Card Sound.

MR. POSTON: Thank you, Mr. Reed. The question then arises: Was the effect of the Pollution Control Act, which was passed by the legislature, sufficient in content, in power and in scope to give you the tools necessary to deal with the problem of this magnitude?

MR. REED: I would answer it negatively. At the moment we have 82 employees. We do not have a lawyer as of tonight. We have a huge budget of less than $1 million. We have been in operation since July 1, 1969. I would be frank to admit to you we do not have the expertise in this area and possibly in other areas at this stage of development. We are a developing embryo at best, and I think it will take more than a couple of years, maybe three or four for a department, Senator, that has come from so far back, as you well know; and you knew. That is one reason why you were such an advocate for the commission of the department. We had three changes in the last four years. You know how far we had to come. We had enormous staff problems. I think we are entirely competent in the field possibly of sewage waste, but we are in a very difficult gray area where I would be frank to admit that the expertise is not available to us. It is not available in very many States of the Union, because it is a new threat to the environmental area and a recognized threat.

I think the Florida Power & Light would be the first to tell you, when they applied for the permit and the AEC gave it, very few of us recognized the implications of thermal increased water discharges to bays, rivers and lakes in this country.

It is not anyone's fault that we are here. It is just that this entire thing has caught up with us very quickly. I don't think there is any question in anybody's mind that had we known some of the problems involved, putting a very large nuclear plant on an enclosed estuary, that another site would have been found. But the Florida Power & Light Company didn't know the problems.

The regulatory agency didn't know the problems at that time. I wonder if we fully comprehend the problem now. I doubt it, after hearing the testimony in the last 2 days.

MR. POSTON: It poses two problems, as far as I'm concerned, and I would like to present them for the consideration of the Board.

I personally, No. 1, subscribe to State rights, and I think States ought to try to resolve their problems and use every remedy available to them to solve them prior to seeking help from the Federal Government.

Apparently we didn't do it in this instance, but we exercised an alternative which, in the judgment of those in power, may have been the right decision. But as a byproduct of your work product here, I would like to urge the commission to please make recommendations that may be used by the legislature to strengthen our position if such should be necessary in your findings.

MR. REED: I guarantee you that I will be bringing to the legislature a number of recommendations, including the one, Senator, which you mentioned, which was passed unanimously at yesterday's State-countywide meeting of county officers throughout the State -- that we go to a State-funded, strong, regional approach to the problem rather than the multiplicity of local programs.

I understand that Commissioner Earl Starnes backed this up yesterday. I think he may have made the motion, and it was unanimously carried. I don't think the fragmentation of our effort in the State of Florida is going to accomplish an ultimate aim and objective, which is an enhancement of the environment of Florida.

That will be one of the recommendations that I will be bringing to your distinguished committee.

MR. POSTON: Thank you.

MR. REED: The next speaker is Dr. Martin Roessler.

DR. MARTIN A. ROESSLER,
ASSISTANT PROFESSOR,
SCHOOL MARINE & ATMOSPHERIC SCIENCES,
MIAMI, FLORIDA

DR. ROESSLER: I am Martin Roessler of the School of Marine Sciences. I have a Ph.D and have been working in this area for about the last 9 years on the ecology and fisheries of Biscayne Bay and in the Everglades National Park.

The reason that I am here to speak today is that both sides have quoted several documents that have been produced by the Institute of Marine Sciences. One of these, "The Effects of Thermal Additions on the Biota of Southern Biscayne Bay," by myself and Joseph C. Zieman, Jr., which is a summary of approximately 18 months of work, supported by the FWPCA, and in this report we concluded that the heated water dumped into Biscayne Bay has reduced the diversity and abundance of marine animals in small areas adjacent to the mouth of the effluent canal at Turkey Point. The region where virtually all plants and animals have been killed or greatly reduced in numbers corresponds closely to the +4°C isotherm. and includes an area of about 125 acres.

A second zone in which algae have been reduced in number and diversity and in which there is damage to the species corresponds generally to the +3° isotherm and covers about 170 acres.

In the first area there was a decrease in the algae, and in the second area the number of molluscs crustaceans had increased somewhat. We feel this is due to a large amount of dead algae which is a source of food for many of these molluscs and crustaceans.

The areas we have presented have been stated to be at odds presently by those with the FWPCA and AEC. Let me remind you the areas that we have here in this report for the algae and grass data cover a period, an average over a period of from February through September, so that includes a cold period and a warm period.

The animal data is a composite average of a year's data again covering winter, spring, summer and fall, so that it is a net yearly picture. This paper was presented at the Gulf and Caribbean Fisheries Institute, and the annual report that we have here contains much supporting data to this.

I would like to submit it to this board for their consideration in their deliberations.

MR. STEIN: Without objection that will be received as an exhibit.

(The above-mentioned document, marked Exhibit No. 4, is on file at Headquarters, FWPCA, and the Southeast Regional Office, Atlanta, Georgia.)

DR. ROESSLER: That is all I have. If you have any questions, I'd be glad to answer them.

MR. REED: No, I have none.

Mr. Kauffman?

MR. KAUFFMANN: The good is sometimes left to the last.

MR. REED: Absolutely.

MR. KAUFFMANN: So let it be so. I have to bring --

MR. STEIN: Identify yourself, please.

MR. KAUFFMANN: Pardon me.

MR. STEIN: Why don't you identify yourself?

HENRY A KAUFFMANN,
DADE CITIZENS FOR CLEAN WATER,
S. MIAMI, FLORIDA

MR. KAUFFMAN:

I will do this. I am Henry A. Kauffmann. I took the liberty of leaving a letter in front of you. I am the creator, to use that word, or the director of the newly formed, in the last weeks, Dade Citizens for Clean Water.

(The above-mentioned letter follows.)

DADE CITIZENS FOR CLEAN WATER

February 24, 1970

Dear Friend Dade Citizen,

This is intended as a frank letter.

You wouldn't be at this meeting if you weren't greatly interested in our plight of your contaminated waters. We formerly called it pollution.

Deep and thorough study has convinced others and me that a Dade Citizens for Clean Water group is necessary.

The dedicated stalwarts, The Audubon Society, The Izaak Walton League and Hoover Environmental Fund are each and all excellent. Frankly, they need citizens help for their fight to save our environment; and thereby save us. Aroused, you citizens are needed from every walk of life.

Unfortunately or fortunately, I've been over 50 years as a disillusioned conservatist fighting inroads only. You and I must take the needed action to unite, and the leadership will be you scientists, housewives, students and men of all professions.

We are not theorists. In Pennsylvania, the citizens through funded effort, the Delaware Valley Citizens for Clean Air are winning an air pollution war. First things first; in Dade, we want and intend to have clean water.

Just name, address and phone number is enough till our ranks swell.

How effective we will be is a question of size and dedication. If you see me, I'll be wearing a bright red carnation for identification. Bring you signed or printed acceptance or sent it.

Sincerely,

Henry A Kauffmann

Henry A. Kauffmann
P. O. Box 324
South Miami Post Office, 33143

No Solicitations yet!

Henry A. Kauffmann

My credentials are that I am a little over 50 years -- not of age; you have me there -- 50 years as an Izaak Waltonian. I am 35 years here in Miami. In this period I have spent a great deal of time in the outdoors as a protector. Before that my office was in Philadelphia, something like 40 years -- free rent to the Izaak Walton League. So we have credentials to say that we know a little about environment, but we were always fighting small skirmishes.

I am talking without looking at what I have to say here. In my experience with the Turkey Point matter, which is the core of the situation, I have to almost repeat what the three speakers said before -- Mrs. Wainwright, Mr. Lewis and Mr. DeWolf. And I am not on anybody's side, but I am on everyone's side. I am on the side of nature and God and good work, and nothing else. And I think that I have your ear on that, and I think I have your minds.

I was appalled that I could not find when the meetings were occurring -- with a great deal of difficulty -- that is, of the Pollution Water Control Board. Do you know that it was never in the newspaper, or at least I couldn't find it. And I had to keep on calling, and finally I would find here the next day, or 2 days later on, that Thursday there would be a meeting.

MR. REED: Is this the local board?

MR. KAUFFMANN: The Pollution Control Board -- that is Dr. Hughes' board -- the one that he heads up. And I want to call them all very charming people, but they are not environmental, ecological or conservation people, in my mind. They may have some -- they do have some good qualities, excellent qualities, and any one who gives their time as a volunteer deserves approbation, and I give it to them for that.

Dr. Hughes said -- let's go back as far as I can go in my four meetings. I first went up to New York when the problem bothered me. After 50 years, why couldn't I do something about it, know something about it? So I went up to the AEC at the Battery end. They gave me three or four good men with doctorates. They gave me a long story. One of them wrote a letter to our friend, Col. Davis here. He wondered why I didn't come to see him. I had nothing to sell. All I wanted to see was had these things happened, and, if they did, let it be at a minimum -- at an absolutely minimum waste. If you can't have them without a minimum waste, you are doing what has been done countless and countless times over. You are presenting the side, or it is being presented on the side of industry, technology, and research, but not the side of who is going to live in it.

I am on the end of the link, but there are other links coming beyond us since Adam and Eve. We have to get these things back. If we could hold the line, that is all that I can ask you to do, and this is what has to be done.

Now, I'll have to go ahead by saying, all of a sudden, I saw when I came to the meeting -- and there were about four meetings that I came to -- the gentlemen know that I attended quite regularly at that point when I came back from the north. When I came back from the north I also studied that there was another group; namely, the Pennsylvania group that you all know about in the Delaware River Valley Clean Air Group, under Norman Childs, that had banded together, and they changed the laws both in the Philadelphia area, which was difficult, as you know, and Gov. Shaffer's law.

They have drawn the line. If you want to know more about it, I have all the information to give to you, naturally, for nothing.

When I came to this meeting I was appalled to see that the Florida Power & Light -- bless their souls, they give me electricity; I pay for it, but bless their souls, they have a right to be -- they had a written out variance by them in every way. I looked at the board. I was quaking before this great number of people, and this wonderful, wonderful group. So I went up to Mr. Childs, Dr. Childs, just before the meeting and 3 times afterwards repeated the same questions, "Where is your knowledge? Who do you have on your group that can answer environmental problems that we have here?" He said, "We don't need it. We have the Florida Power & Light engineers." So help me. You cannot make a problem like that for us humans at that limited time for our children and grandchildren.

After that we went to the three appeal meetings, and I want to say they were preshadowed and preordained, which is the same thing the gentleman said here.

I want to leave you with this thought if I might. We need a pollution board here, but we need a good active, well paid and funded pollution board. I am not afraid of the Federal Government if they come in and tell us we are doing no job, but it is true -- or the State -- but I don't like to see the three of you get together, act separately. I would like to see you get a streamlined understanding of how you can handle problems. That just doesn't mean thermal because that is the toughest, or I wouldn't have spent all the time and money to find out, and I want to tell you it is tough.

There is a big meeting coming up. It is going to meet up in Boston, and there will be environmental scientists. I saw this in The Miami Herald today, and they are charging $150 a person for a conference, and everyone is going to talk about it.

I agree with you, no one knows. But let us not be the guinea pig. I'll give you three more things, then I'm done.

About 15 years ago, I pleaded that they not put an outfall system or sewage system into Biscayne Bay over on Virginia Key. They kept on and set us back and set us back. I say "us," meaning a few fellows working with me, and we failed. I am happy to say we succeeded against Seadade when they wanted to put their plant up. I am happy to say we succeeded against Florida Power & Light when they wanted to put up another stack at Cutler. I am happy to say that we are alive, but whatever you do, keep us that way.

Thank you.

MR. REED: Thank you, Mr. Kauffmann.

Dr. Grune.

DR. WERNER N. GRUNE,
PROFESSOR AND CONSULTANT,
UNIVERSITY OF MIAMI,
CORAL GABLES, FLORIDA

DR. GRUNE: My name is Dr. W. N. Grune, Mr. Chairman. The time, I know, is getting late, and I am not going to take more than 6 or 8 minutes if I can possibly help it.

I am a professional sanitary engineer, and I have a B.S. in Engineering, and a Ph.D in Engineering Science and Nuclear Sanitary Engineering. I am a Diplomate of the American Academy of Environmental Engineers, and I am a Registered Professional Engineer in three States.

Dr. Werner N. Grune

I have been associated with the water pollution control game since serving with the Government under Public Law 845 since 1948, some 20 years ago. I have been devoting a great deal of my time to teaching and research and sanitary engineering, including nuclear wastes. And I have been a consultant to several Federal agencies, including the AEC, the Public Health Service and U.S. Air Force. (See appended resume.)

Presently I am at the University of Miami, School of Engineering and Center of Urban Studies.

Specifically cogent to these deliberations here, about 2½ years ago I completed a report on the impact of future sites of nuclear powerplants, mainly the Commonwealth Edison powerplant on the Great Lakes. One thing I would like to say, having sat here for a couple of days, whatever time I could devote between classes -- I'm going to be late for my 5 o'clock class.

Now, as to the outfall, we are talking about $120 million outfall if we ever went out beyond the reefs out into the --

MR. RRED: The ocean outfall, you mean?

DR. GRUNE: -- the Gulf Stream. That is about 12 miles. Some people have said 8, 10 and 12 miles. It would cost about $10 million a mile, or roughly $2,000 a lineal foot. The various estimates of the outfall would vary from $110 million to $125 million dollars.

I have not seen all of the reports, by a long shot, but that's 10 percent investment of the total plant invested that's involved.

I have not had a chance to write up anything formally. I had to do this as I sat here. Obviously, private industry cannot be asked to build this alone -- it would be a financial fiasco. On the other hand, we have data showing steadily increased biological insult to Cutler Bay -- a progressive degradation of the aquatic flora and fauna of that particular area. These data are backed up by aerial photographs showing what happened between 1938 and 1969, particularly continuously increasing denudation of the Cutler area from 1956 to the present, as measured among other things by such parameters as: Plant standing crop, sediment particle size analysis, invertebrates, animal species, diversity index, etc.

Now, it has been documented that the plant will have only 348 megawatts or 14.8 percent or not quite

15 percent of the 2,384 megawatts when Units 3 and 4 are installed and become operational. Therefore, with proper respect to all those present and their many deliverations, studies, reports and timeless effort to prevent eventual destruction of the ecology of Biscayne Bay at a fourfold increase of the present heat input rate; thus I wish to propose the following:

First, a revised cost study of the ocean outfall to the Gulf Stream. This outfall has been variously reported to be 13 miles and 12 miles and so on from the discharge; with a new system of pipes of about 15 to 17 feet -- actually, simple engineering calculations show readily the dual 15 foot system, such as someone has proposed, 12 feet per second velocity, a velocity range which would give way to prohibitive cavitational problems. I don't know how long that might exist.

Now, a dual 20 foot pipe, per second, would probably be more in the order of magnitude, but these are small minor details. Nevertheless, I propse that such a system can be engineered for perhaps a value of $60,000,000, perhaps half the price tag that has been discussed, or $60,000,000 for 12 miles, by assuming an average of $5 million a mile, or $1,000 a lineal foot. This would include dredging, construction of pipe booster pump stations that would be involved, and the dredging which would be a major cost, but I think there you might have some help from Uncle Sam. And why not get help? This region needs power, and also represents one of the favorite playgrounds of the Nation and we must preserve these vanishing frontiers as man puts on his aqua lung to enjoy his leisure time.

I know that the Corps of Engineers have done wonders in deepening the rivers and the canals. They worked wonders in Philadelphia, and in Long Island, in keeping the shipping lanes open in our Great Lakes. They did this in the face of solving problems of pollution, and they are not small.

While we are talking about Uncle Sam, the Federal Water Pollution Control Administration would be very glad to see the morning glory spillway near morris Cut.

In addition to the idea of suggesting that we look at a combined outfall; that is, outfall far enough to get to the Gulf Stream, there is a second consideration. Perhaps this is the time. We have listened to a lot of problems. Perhaps we should look at some other alternates, and although they have been looked at there's always time or reason for reevaluation.

This is the so-called Multiple Effect Humidity Cycle, a process that I was fortunate to be involved in, and work for, for the office of saline water, U.S. Department of Interior, which poured in $150,000 in research money into this in the late fifties and early sixties. A pilot plan was built at Penasco Sonora right near the University of Mexico. The plant operated at about 180 gallons per minute, which is a small bagatelle, 260,000 a day, roughly; but the results of this work is available on license free from the Government It's one of the Government publications, U.S. Department of the Interior, a green cover report. I think it is No. 294.

Now, it should be emphasized that this work was undertaken to convert sea water, but the principles are the same. The heat transfer aspect of this process are aspects that are of interest here. I would say it is germane to this problem.

I have not been asked or given permission or requested to undertake any detailed studies; therefore, I have no final cost estimates of a scaled up plan, but this work has actually not been published other than in the original final typed report.

By the way, this is a wet cooling direct contact process, closed loop which does not provide for the air to be moved in or out. It is a wet cooling process basically.

I would like to mention one other aspect, and that is work that has been going on for the German Federal Republic, Department of Fisheries, Department of Agriculture-Fisheries Division, just outside the city of Munich where they have constructed a series of canals, and I think that that might have some worthwhile value. Some of you may be aware of this.

MR. STEIN: Thank you, Professor. Are there any questions? If we are going to take all of these studies, what are we going to do in between? Are we going to operate the plant or let them finish?

DR. GRUNE: The pipeline is not a matter of study. The other one, the cooling tower is.

MR. STEIN: The cost is a matter of study. Again, we have run the whole gamut here. I know that. For example, I'm not without some acquaintance in this business, and only this morning I was talking about the pipeline and the possibility of a pipeline. I understand that the ordinary mechinery to be used for laying pipelines in this country would not be adaptable under the present conditions for this kind of pipeline. You have to lay these big pipes, and the expense naturally would go up.

The problem that we have here then -- let me try to give it. The professors have to live, and they give us all these wonderful ideas, but we do have a problem where the plan indicates they want to go into operation by next summer.

Mr. Reed has indicated that Central Florida needs more power. I think we need a commitment for a solution at this time. Really. Not for a study. That's what we are looking for, and we have to come up with something which is going to give us the solution. We are always faced with that disagreeable task.

I think what you're saying is very good because I do believe that we are dealing with thermal pollution problems. We have a long way to go. This is not the end of it. But we have to come up with a solution based upon present knowledge no matter how imperfect that is; otherwise we don't have a commitment.

DR. GRUNE: I was not even thinking in terms of Unit 3 because that's a foregone conclusion at the open channel.

MR. STEIN: I didn't know it was a foregone conclusion.

DR. GRUNE: The other matter is two or three years hence; that is, before the actual operation starts. It may be a good idea to look into it during that period. At the same time, it would solve a very nasty problem; namely, the sewage outfall. Logistically, we are not adjacent to each other. It is not a problem, another 20 miles or 25 miles. But again these are not insurmountable engineering problems.

MR. STEIN: You raise another problem. It has come up in Congress and been rejected, when you made the suggestion -- I don't want to hold out any hope for you that we are going to get the Corps of Engineers to participate in the dredging. I don't know where you get the notion that I'm going to recommend it or push it.

DR. GRUNE: The Corps is stretched pretty thin just doing their navigation and flood control work, and I don't know that we are going to ever get into the principle, at least in the immediate future where they are going to do dredging for commercial operations or commercial discharges, despite what they say.

MR. STEIN: I know they did a wonderful job in the Delaware River. I know. I worked on that with the Corps, and they have a continuing job all the time. That job isn't finished at all. I don't think anyone is satisfied with the flushing of the bay now in the Delaware channel. It needs constant repair. I don't know that we can spare a boat. I don't want to speak for the Corps, but they keep busy around the clock.

Are there any other comments or questions? If not, thank you very much.

MR. REED: Mr. Chairman, I would like just to keep my card file straight for tomorrow, if I could call these names, and I will set up a new pattern of appearances, or at least find out who among the cards that I have here are still with us and who still wish to be heard.

Mr. Murphy? Mr. Togue or Laug, from Tennessee Mr. Thompson? Mrs. Perry from Belle Air?

MRS. PERRY: I'm here.

MR. REED: Mrs. Perry, would you be with us tomorrow?

MR. PERRY: Yes.

MR. REED: We'll start with you tomorrow.

Dr. Stevenson, Institute of Marine Sciences. Arthur Calvert, Miami Regional Office, Florida Department of Agriculture. Mr. Sales from the Kiwanis. Mr. Sergio De Levaga. Mr. Haller. Mr. Cogins. Mrs. Dean, from the Florida Federated Garden Club. George Cooper, Jr. Mr. Neidlinker. Mrs. Oakershon, Miss Moore Mr. Hoffman. Mr. White.

Mr. Chairman, we have one person. We have Mrs. Perry. Why don't we clear out now.

Mrs. Perry, I hate to ask you to come back. Would you please, because the hotel has made this request to us. I'm giving up a Hillsborough Bay hearing tomorrow.

MR STEIN: Thank you. We are going to meet in the Parliament Room.

MR. REED: Why don't I make this request of you, Mr. Chairman. This request I have, I am making for myself, Mr. Chairman. In Florida we operate under a rule of legislature or law of legislature called the "Sunshine Law," which means anything done by the public servants in the State of Florida must be done in the open, and not in any type of a private meeting.

When we had the meetings in Escambia Bay you will remember that we did, in fact, go on the Federal Rule and did have an Executive Session.

Two weeks ago I testified in Washington in front of the Senate, and was in Executive Session, which I must admit was too bad because I would have liked the press to be there. Even though I have received an opinion, a verbal opinion from an Assistant Attorney General, that this is a Federal-State Conference, you have every right to call a closed executive session. However, I would ask as a favor of you, because of the intense interest of the Miami press, that we make our final deliberations in whatever room we are able to have tomorrow, whether it is as productive as a closed door meeting would be or not.

MR. STEIN: There will be no objection to this. We will have a public session. I might say that I am in favor of public sessions. I think that the Sunshine Law is a good one, and wish all the States had it. I have held public sessions many times, and surprisingly enough I have been called before the Senate and criticized openly, but I delighted to do it.

MR. REED: Thank you.

MR. STEIN: We will stand in recess until 9:30.

MR. STEEL: Mr. Chairman, will there be any further testimony presented tomorrow other than Mrs. Perry's?

MR. STEIN: If you wish to have any or not, we are going to call for it. If you feel that you have anything pertinent that you want to put in, you can put it in, or if any other people appear they will be given an opportunity to speak. In other words, we are not cutting anyone off once they are here.

MR. STEEL: Mr. Chairman, I would like to request that the record be kept open through the business day of March 13th to submit anything else which we see fit to submit?

MR. STEIN: I think that's a reasonable request. We will be happy to do that.

MR. STEEL: Thank you.

MR. REED: That in no way binds the conferees from making their recommendation.

MR. STEIN: No. We'll make a recommendation on the basis of this. You recognize, though, that the full record goes up to the Secretary, and the Secretary reviews the full record with all the material in it.

MR. STEEL: Yes, but just so that we would have the opportunity through March 13th to introduce anything further that we see fit.

MR. STEIN: I don't think we are going to have any problem. If anything comes in that looks like this, I'm not going to print it in the record, but make it an exhibit. In other words, if you want to get it printed in the record, give us something reasonable in size and dimension.

Thank you.

MR. REED: What time, sir?

MR. STEIN: 9:30 in the Parliament Room.

(Whereupon, the conference adjourned at 5:00 p.m. until 9:30 a.m., February 26, 1970.)